Extensible Access Control Framework for Cloud based Applications

User Manual for ABAC Policy Administration Point

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Introduction

The purpose of this document is to provide *User Manual of Policy Administration Point for Attribute Based Access Control* model for the project entitled *Extensible Access Control Framework for Cloud Based Applications*. This project broadly aims to provide *Access Control-as-a-Service (ACaaS)* for Software-as-a-Service (SaaS) layer applications. It incorporates variety of reliable and well-known access control models as Cloud based services. These access control models mainly include *Attribute Based Access Control (ABAC), Fine Grained Access Control (FGAC)* and *Usage based access CONtrol (UCON)* models. Each of these models is intended to facilitate the service consumers to secure their applications at SaaS layer where the management and evaluation of access control decisions is externalized and handled for Cloud consumers. The major components of the framework include *Policy Decision Point (PDP), Policy Enforcement Point (PEP*) and *Policy Administrator Point (PAP*). All of these components are designed to perform some specific functionality, for-instance PAP, deals with the management of access control policy; whereas, PDP is responsible for the formulation of authorization decision by evaluating access control policy. However, PEP acts as a service gateway between PDP and the requested resource (application or service); it intercepts the authorization requests and forwards it to the PDP for decision making (permit/deny).

This manual briefly describes how ABAC policies are created using the PAP web interface. It further includes detailed screenshots illustrating each and every step that the user might take to complete different processes for all the main phases including 'System Learning', 'Policy Creation' and 'Policy Generation'. This manual is intended for system administrators, who may use this document as the guideline for the generation of access control policy.

Scope

This user manual is focused on ABAC model of the framework that elaborates the use of Policy Administration Point for creation and management of ABAC policies. It mainly focuses on three phases for the PAP which includes 'System Learning', 'Policy Creation' and 'Policy Generation'. The 'System Learning' phase includes the database population with basic policy parameters which are Subject, Action, Resource and Environment. It provides a detailed guideline for a system administrator to add, delete or update the required parameters using i) Manage Subject, ii) Manage Action, iii) Manage Resource and iv) Manage Environment functions. The second phase for the PAP, namely 'Policy Creation', includes the creation of Target, Rule, Policy and PolicySet. In this regard, the document explains how to create, delete and update the 'Policy Creation' parameters. It provides step by step instructions for i) Manage Target, ii) Manage Rule, iii) Manage Policy and iv) Manage PolicySet functions. Furthermore, it explains how to use the PAP interfaces for XACML Policy and PolicySet generation.

Document Convention

DC- 1: The core XACML tags are highlighted with Capital First Letter.

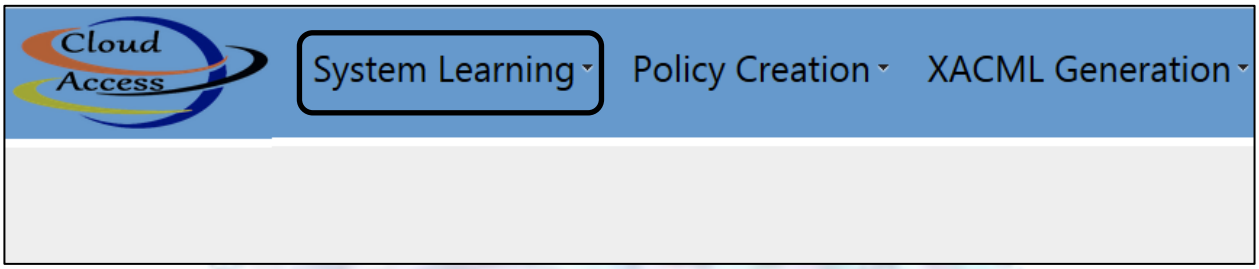
DC- 2: The PAP interface titles are specified with Capital First Letter and *Bold* font style

DC- 3: Names of main PAP phases are written in single quotes with Capital First Letter.

A. System Learning

In this section, we have demonstrated how to create, update and delete the Subject, Action, Resource and Environment parameter in 'System Learning' phase.

1. Select the **System Learning** option from the main interface of PAP as shown in below figure.



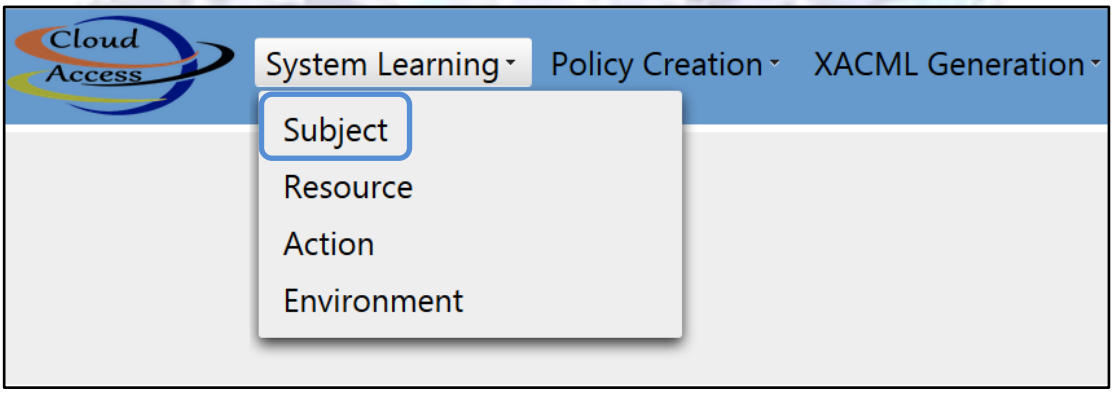
The **System Learning** interface displays the option for Subject, Action, Resource and Environment. Accordingly, the below subsection demonstrates the **Manage Subject**, **Manage Resource**, **Manage Action** and **Manage Environment**.

SL- 1: Manage Subject

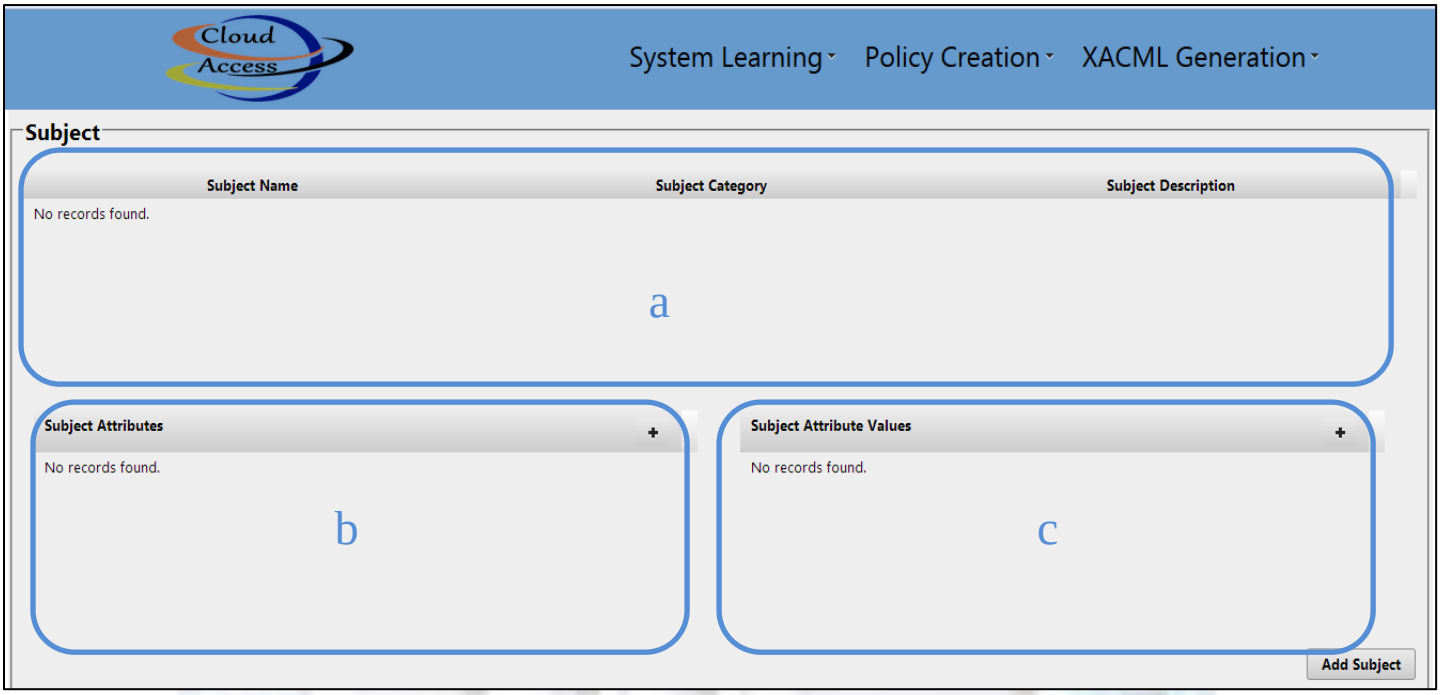
We demonstrate how the system administrator can create, update and delete the Subject parameter in 'System Learning' phase. It further consists of three sections namely **Create Subject**, **Update Subject** and **Delete Subject**.

MS- 1: Create Subject

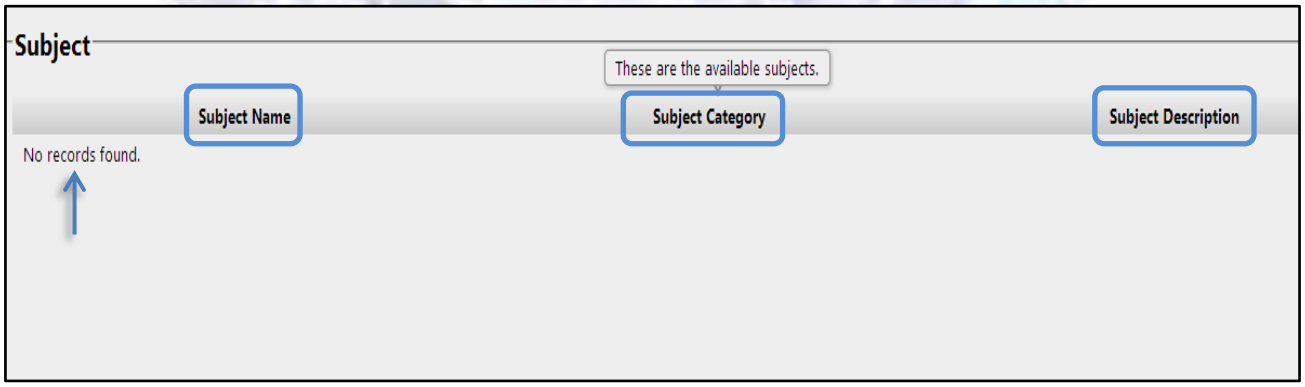
1. Select the **Subject** option from dropdown list as depicted below.



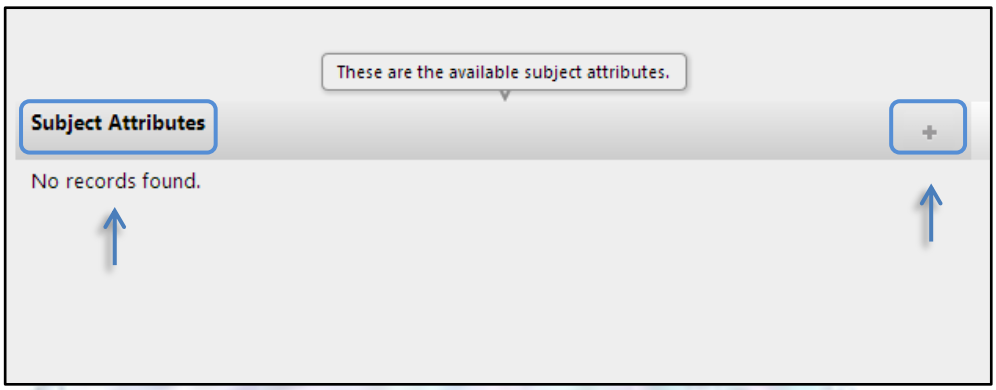
2. After selecting the **Subject** option in previous step, the following appears to add the new Subjects. This interface further includes three main portions as highlighted with "a", "b" and "c" in the below figure.



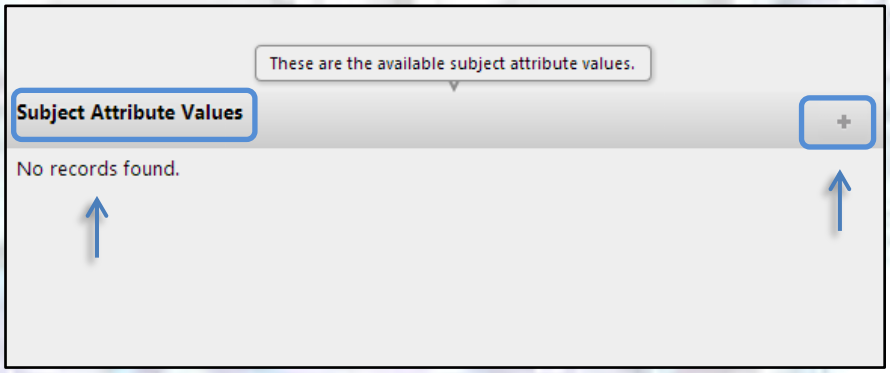
a) The upper portion of the **Subject** interface contains **Subject Name**, **Subject Category** and **Subject Description** tabs. If there are no Subjects in the database, "*No records found*" appears.



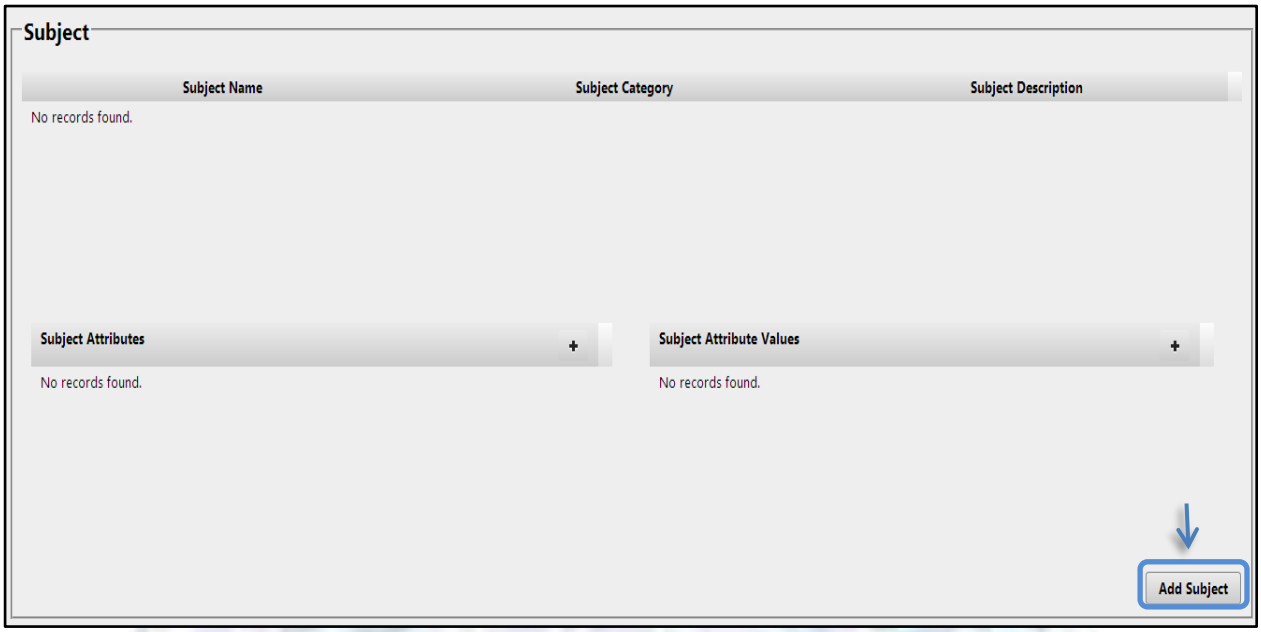
b) The second portion of this interface contains the **Subject Attributes** tab that enlists the added attributes for a given Subject. Initially, there are no records in the database and the "+" button is also disabled.



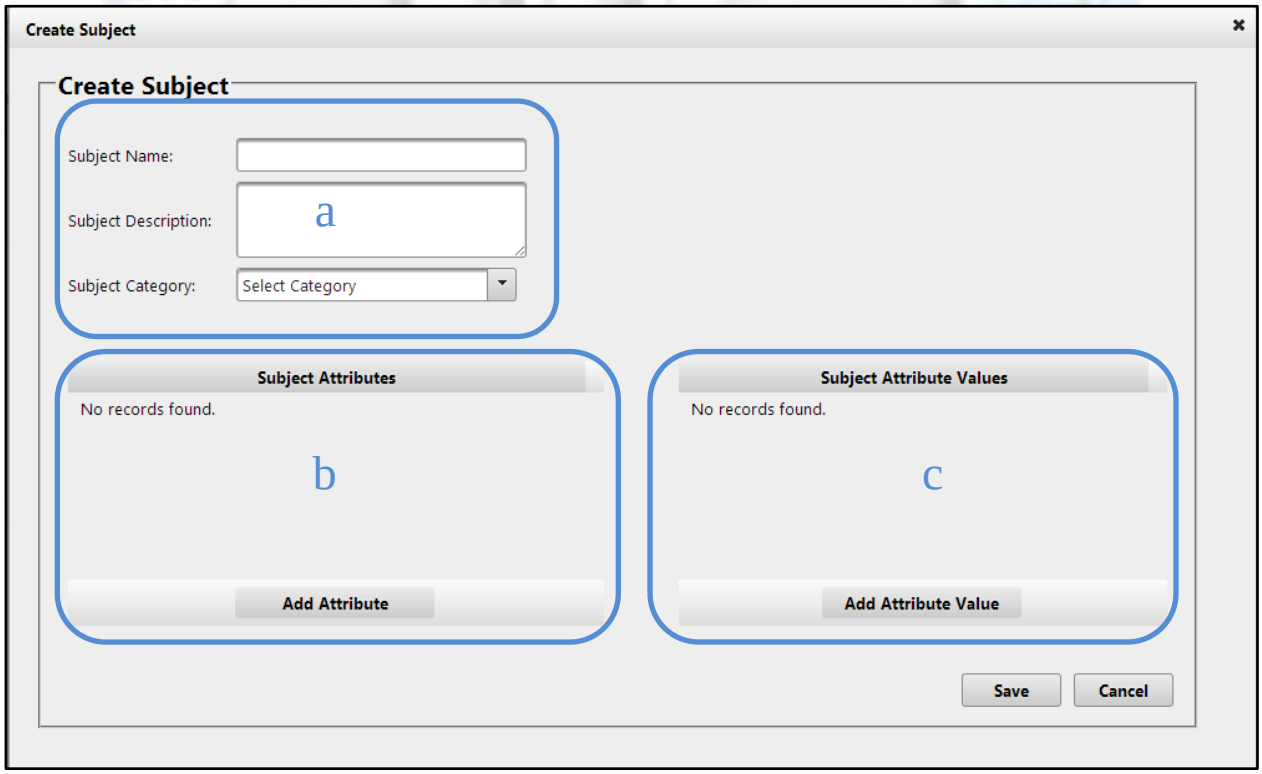
c) The third portion of the interface consists of **Subject Attribute Values** tab that gives a list of different values for a specific attribute. At the start, when no Subject, Attribute and Attribute Values are added, the "+" sign is disabled.



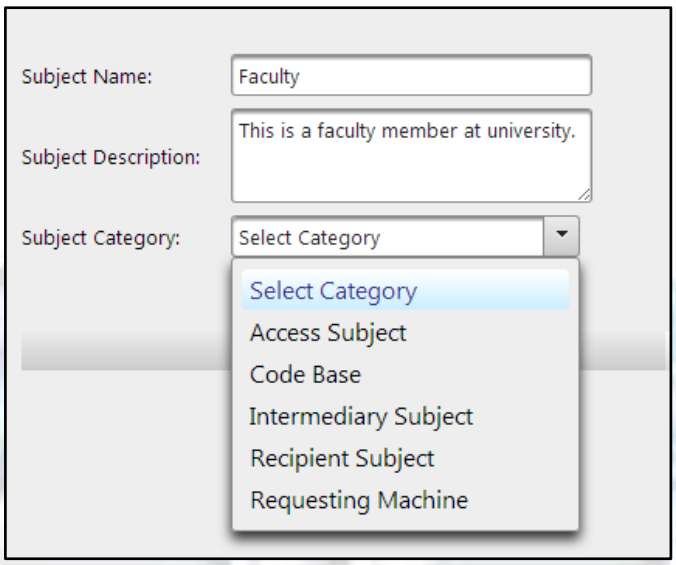
3. Click on the **Add Subject** button on the bottom right corner of the below interface.



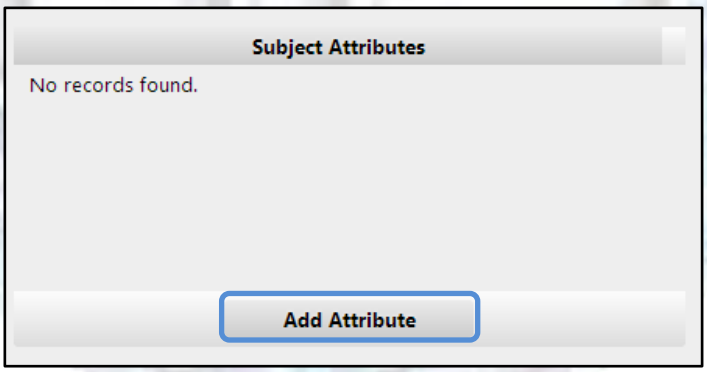
4. The **Create Subject** interface opens to add the required Subjects. This interface further has three main portions to add the Subject , Attributes and Attribute Values as highlighted with “a”, “b” and “c” in below figure.



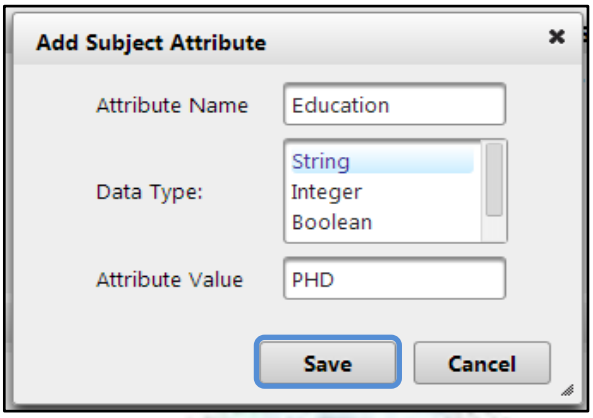
a- 1) The first portion of the interface consists of **Subject Name, Subject Description** and **Subject Category** text box. In order to create a Subject, add the required name and description in text boxes. The required category can be selected from the dropdown list as shown below.



b-1) The second part of the **Create Subject** interface provides the **Add Attribute** button to add the required attributes for a particular subject.

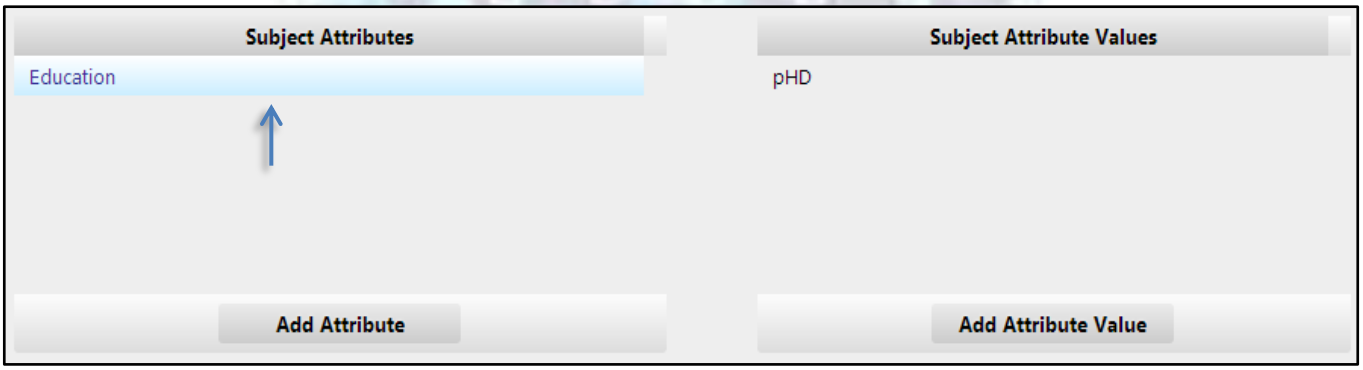


b-2) The following interface appears to add the required subject attributes. It consists of **Attribute Name**, **Data Type** and **Attribute Value** text boxes. Enter the required attribute name, its value and select the data type from the given list. Click on the **Save** button.

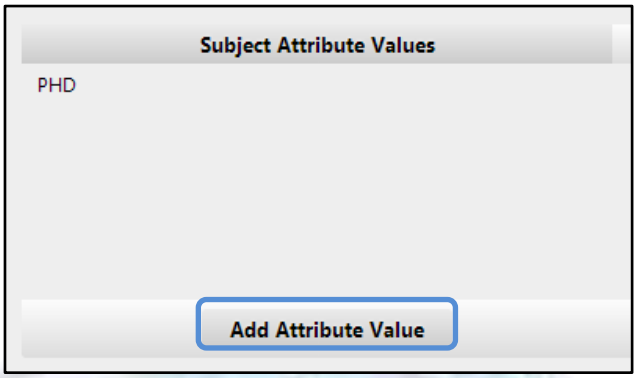


b-3) The added attribute is displayed under the **Subject Attribute** tab as shown in below figure.

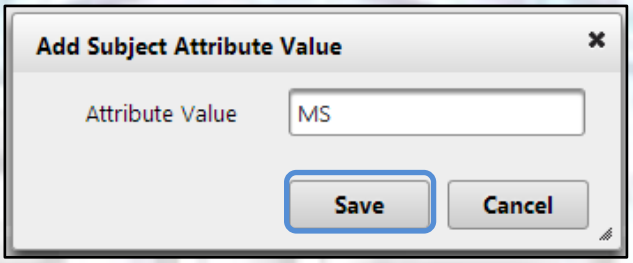
c- 1) The third portion of the **Create Subject** interface consists of the **Add Attribute Value** button to add more than one value for specific attribute. It is mandatory to select the required Attribute from the list of **Subject Attributes** before adding the values. If the **Add Attribute Value** button is clicked without selecting any Attribute, a warning message appears to first select the desired Attribute.



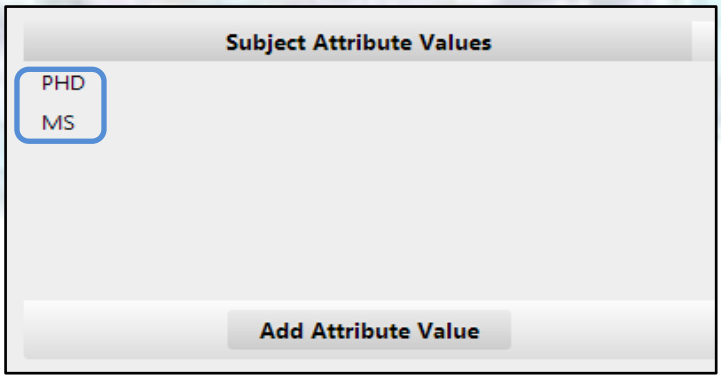
c- 2) Click on the **Add Attribute Value** button to add a new value for the selected Attribute.



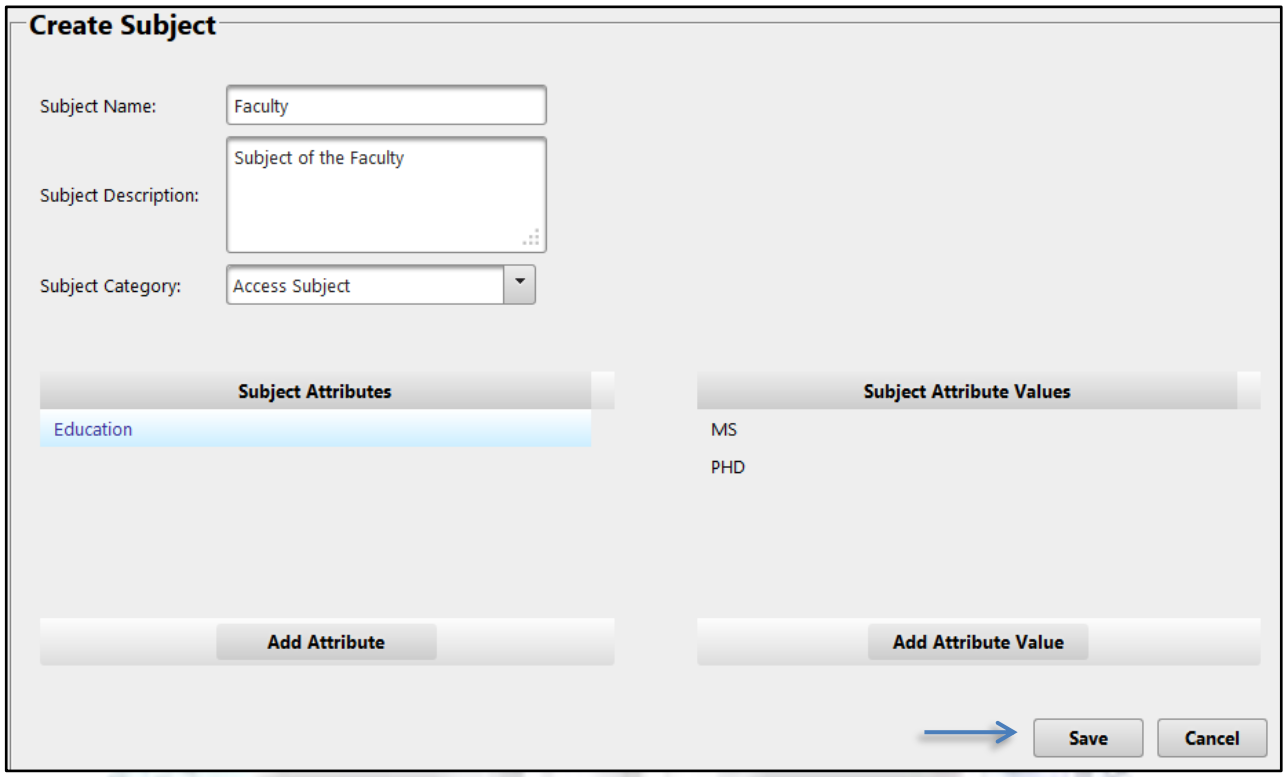
c- 3) The following window appears on the screen containing the **Attribute Value** text box. Enter the required value and then click on **Save** button as depicted in below figure.



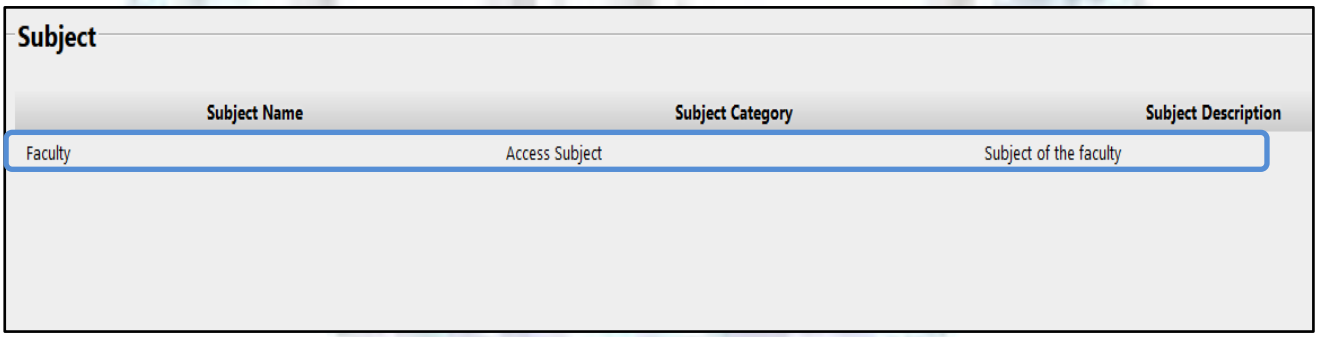
c- 4) After saving the Attribute Value, the following two values are visible under the **Subject Attribute Values** tab as shown in below figure.



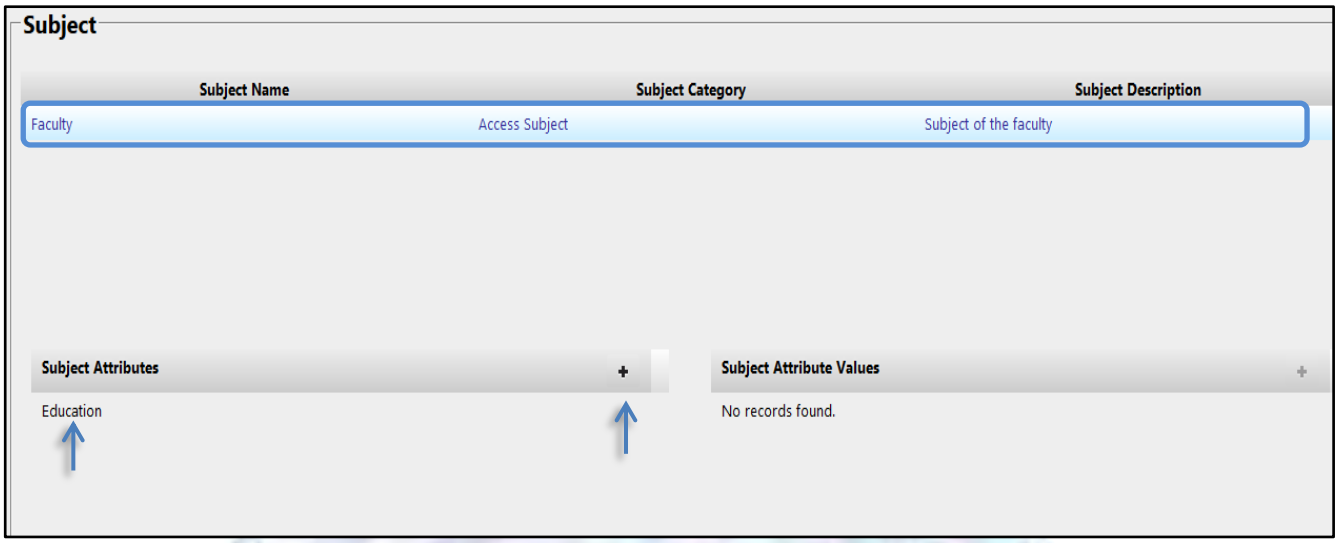
5. Now click on the **Save** button in the **Create Subject** interface to save the added Subject in database.



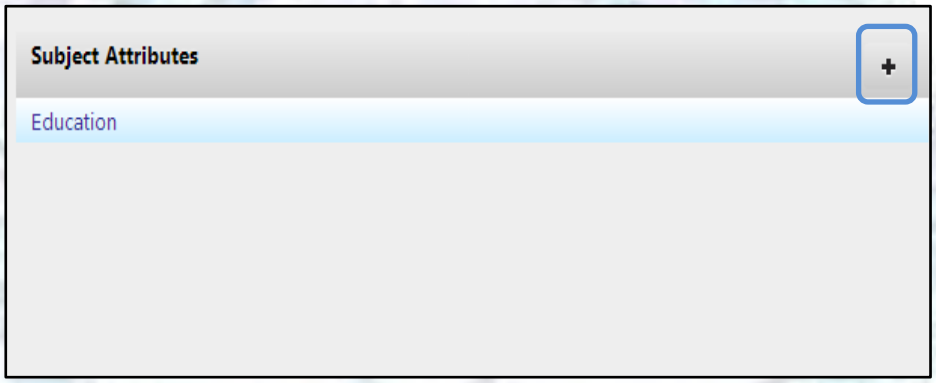
6. The added Subject is displayed on **Subject** interface with different values under the **Subject Name**, **Subject Category** and **Subject Description** tabs as given below.



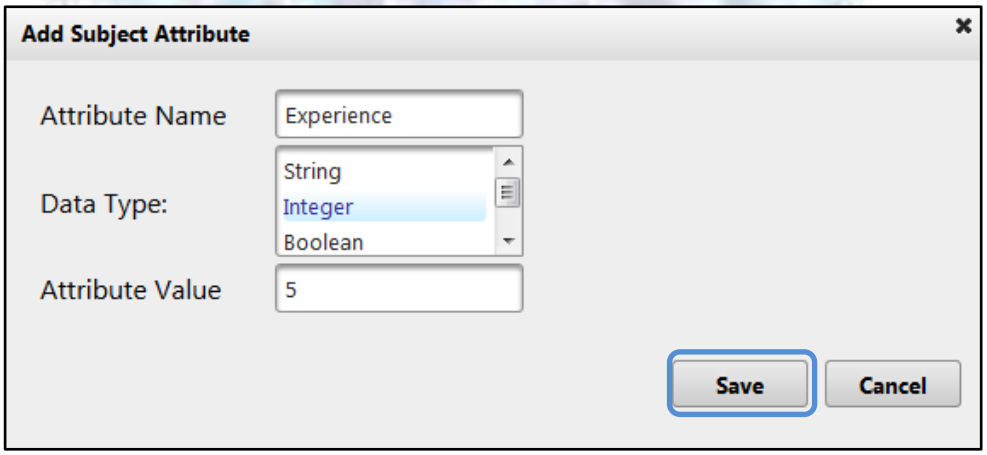
7. Now click on the newly added line of Subject, it gives the Attributes of the Subject under the **Subject Attribute** tab as well as the "+" sign is enabled to add more Attributes for the selected Subject.



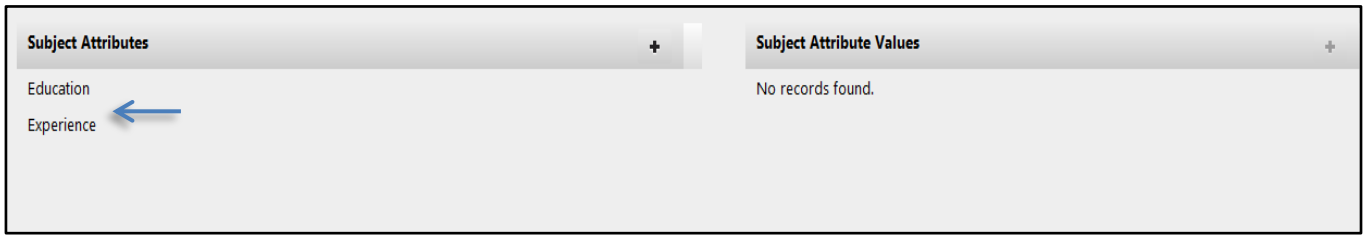
8. In order to add more Subject Attributes, click on the "+" button as shown below.



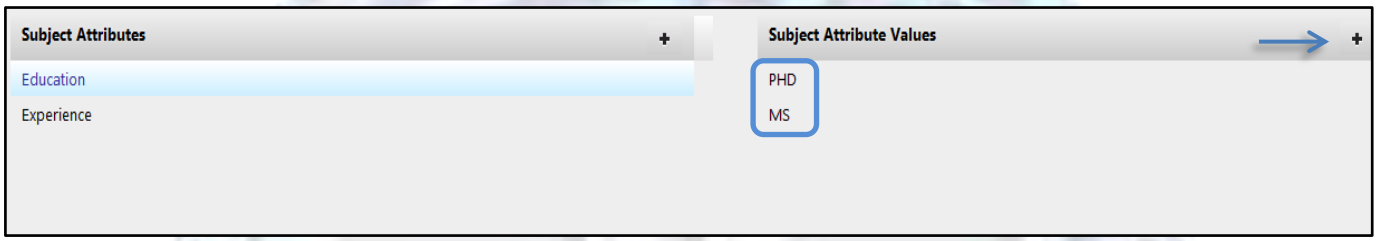
9. Add the required values for **Attribute Name**, **Data Type** and **Attribute Value** and then click on **Save** button.



10. Now two Subject Attributes are visible under the **Subject Attribute** tab as shown below.

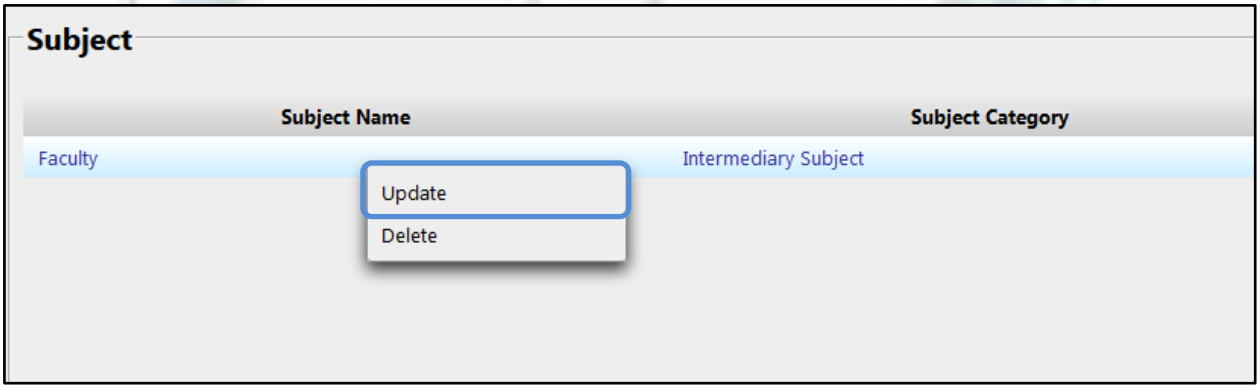


11. In order to view the values for specific Attributes, click on the required Attribute. It enables the "+" button as shown below. By clicking on "+" button more Attribute Values can be added to the selected Attribute.

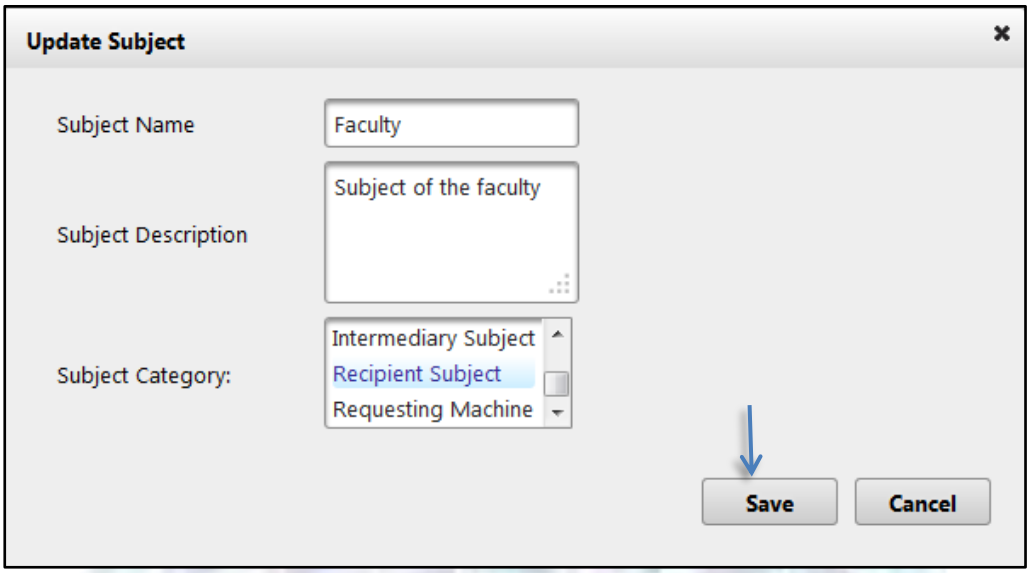


MS- 2: Update Subject

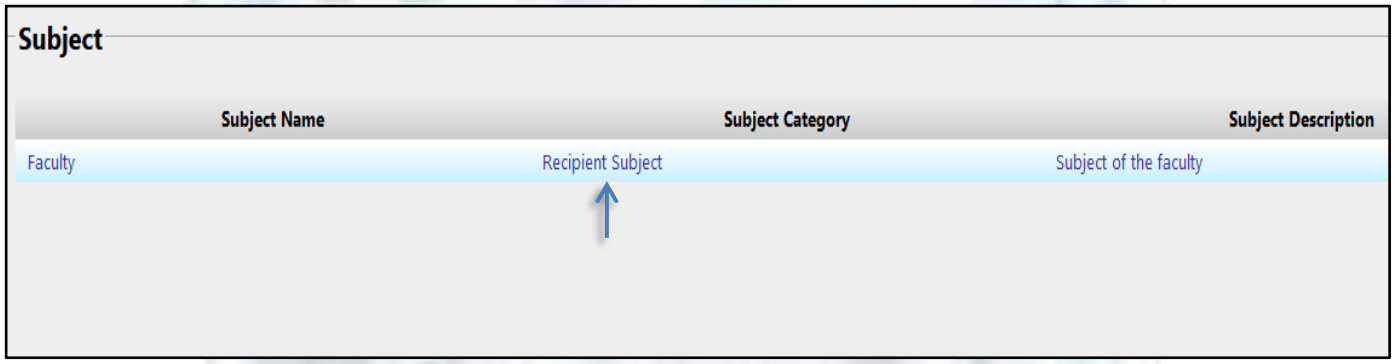
1. Right click on the specific Subject and then select the **Update** option form the menu as depicted in below figure.



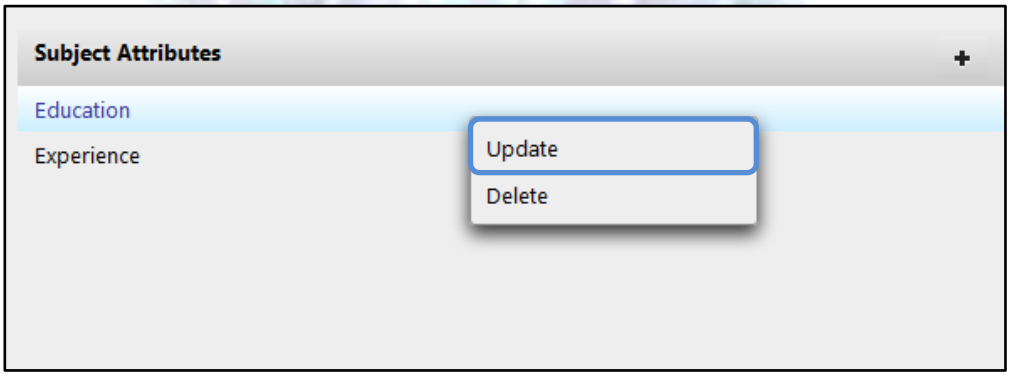
2. The following interface appears after selecting the **Update** option in previous step. You can update any of the three values which include **Subject Name**, **Subject Description** or **Subject Category**. After updating the required fields, click on the **Save** button.



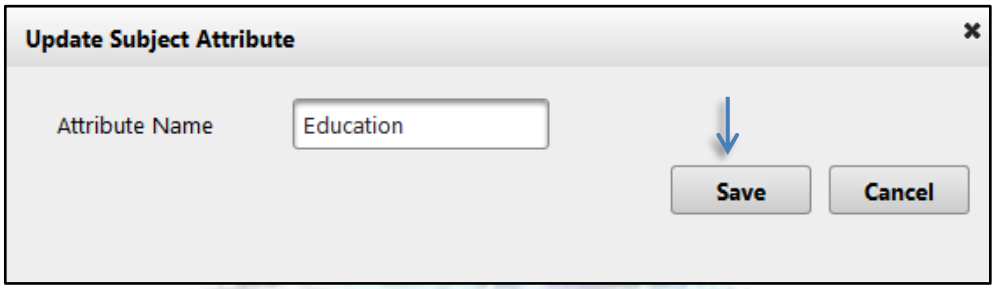
3. The updated results are visible on the main **Subject** interface as shown below.



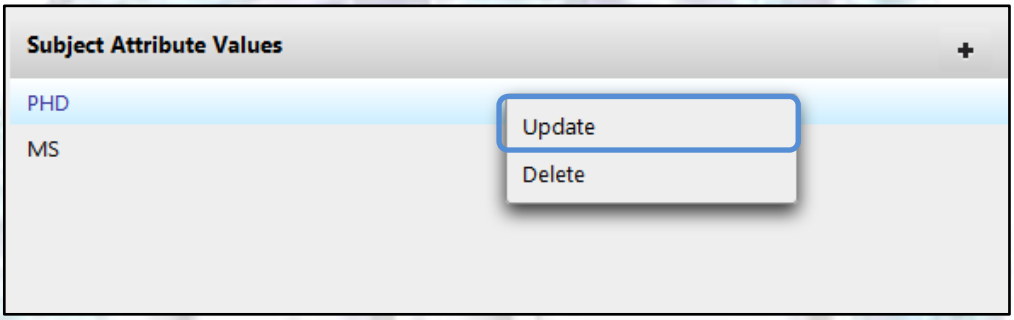
4. Similarly, any Attribute of the Subject can also be updated. Right click on the required attribute under the **Subject Attribute** tab of **Subject** interface. A dropdown menu appears, select the **Update** option.



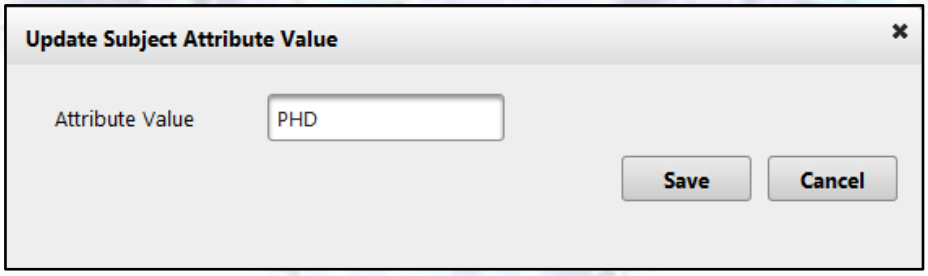
5. **Update Subject Attribute** interface displays on the screen. Enter the required name in the **Attribute Name** text box and click on **Save** button.



6. Similarly, the values for Attribute can also be updated. Right click on the name of the Attribute Value under **Subject Attribute Value** tab. Now select the **Update** option from the dropdown list.

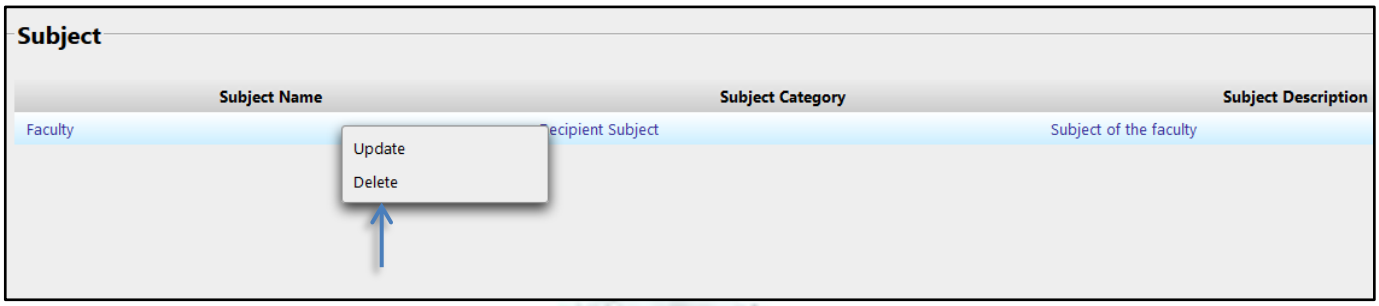


7. The following window appears. Enter the new required value for Attribute and then click on **Save** button.

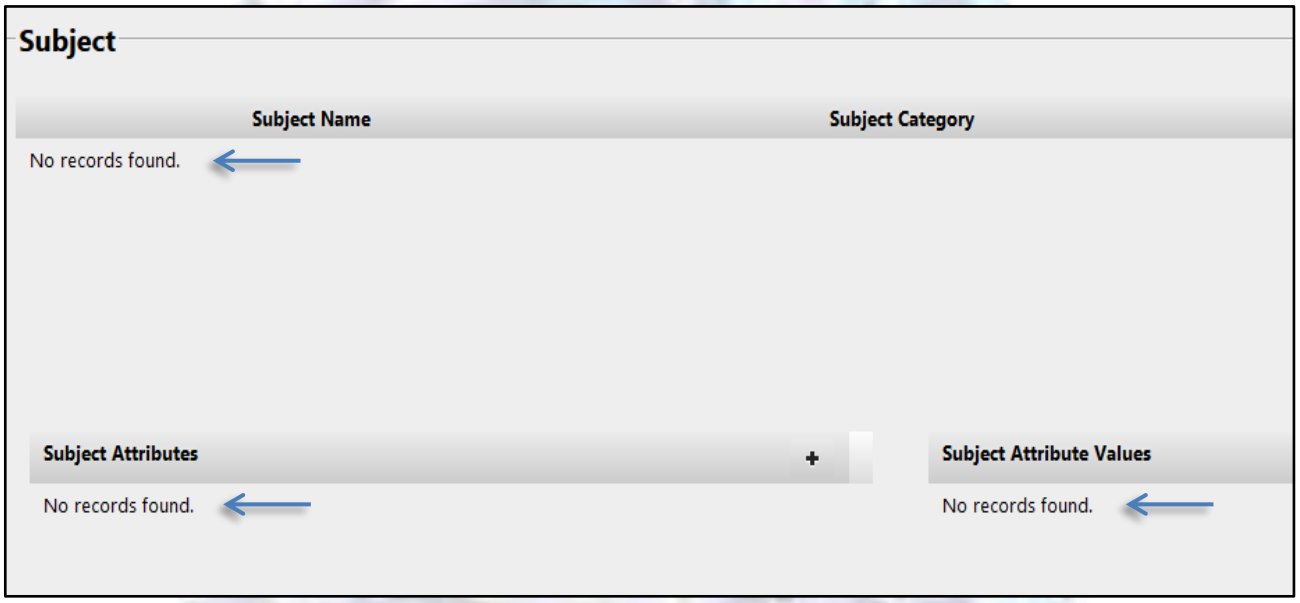


MS- 3: Delete Subject

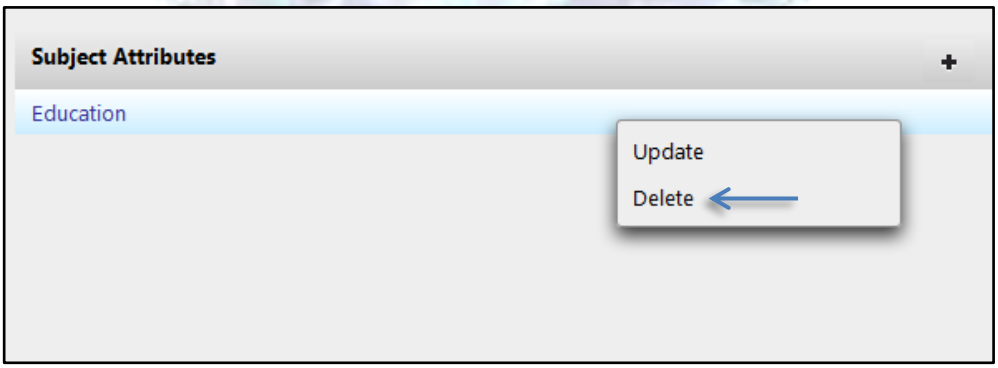
1. Right click on the name of Subject in main **Subject** interface. Select the **Delete** option from the dropdown list.



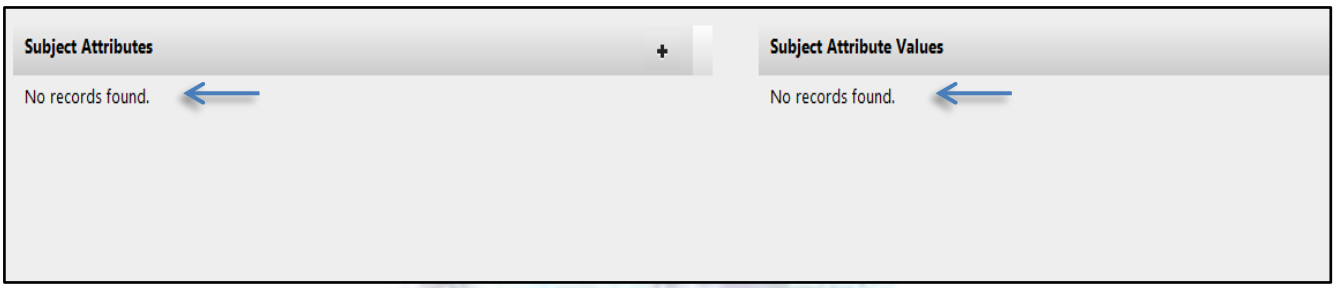
2. The selected Subject is deleted as shown in below figure. The **Subject Attributes** and **Subject Attribute Values** are also deleted for that specific Subject.



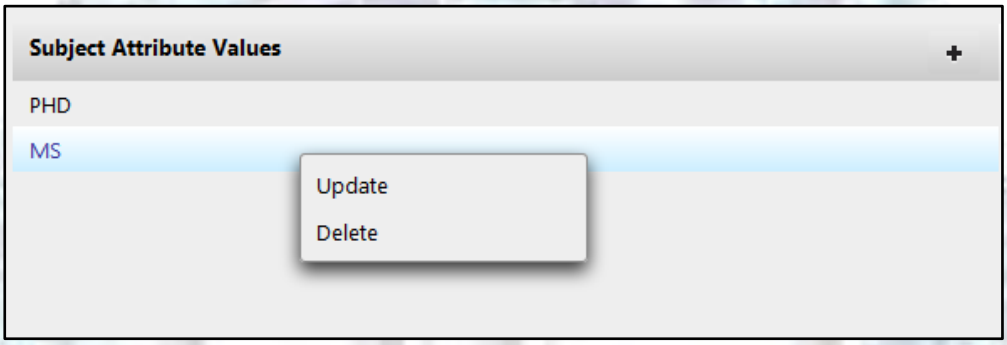
3. Right click on Attribute under **Subject Attributes** tab on **Subject** interface. Click on the **Delete** option from the dropdown list.



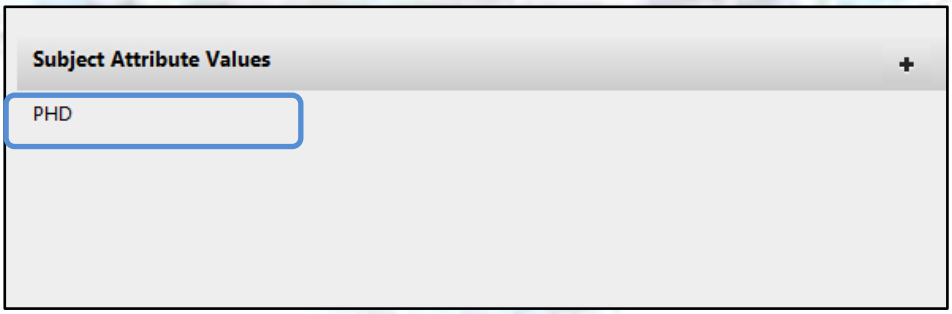
4. The selected Attribute is deleted along with all of its Attribute Values as shown in below figure.



5. To delete a particular Attribute Value, right click on that value under the **Subject Attribute Value** tab and click on the **Delete** option.



6. The selected Attribute value is deleted as depicted in below figure.

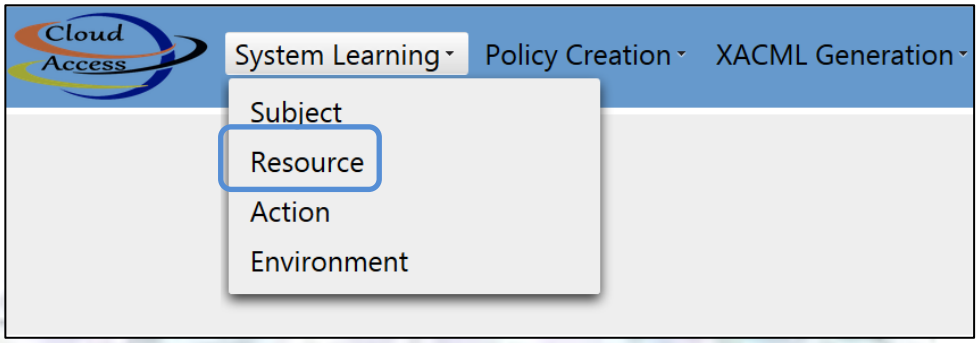


SL- 2: Manage Resource

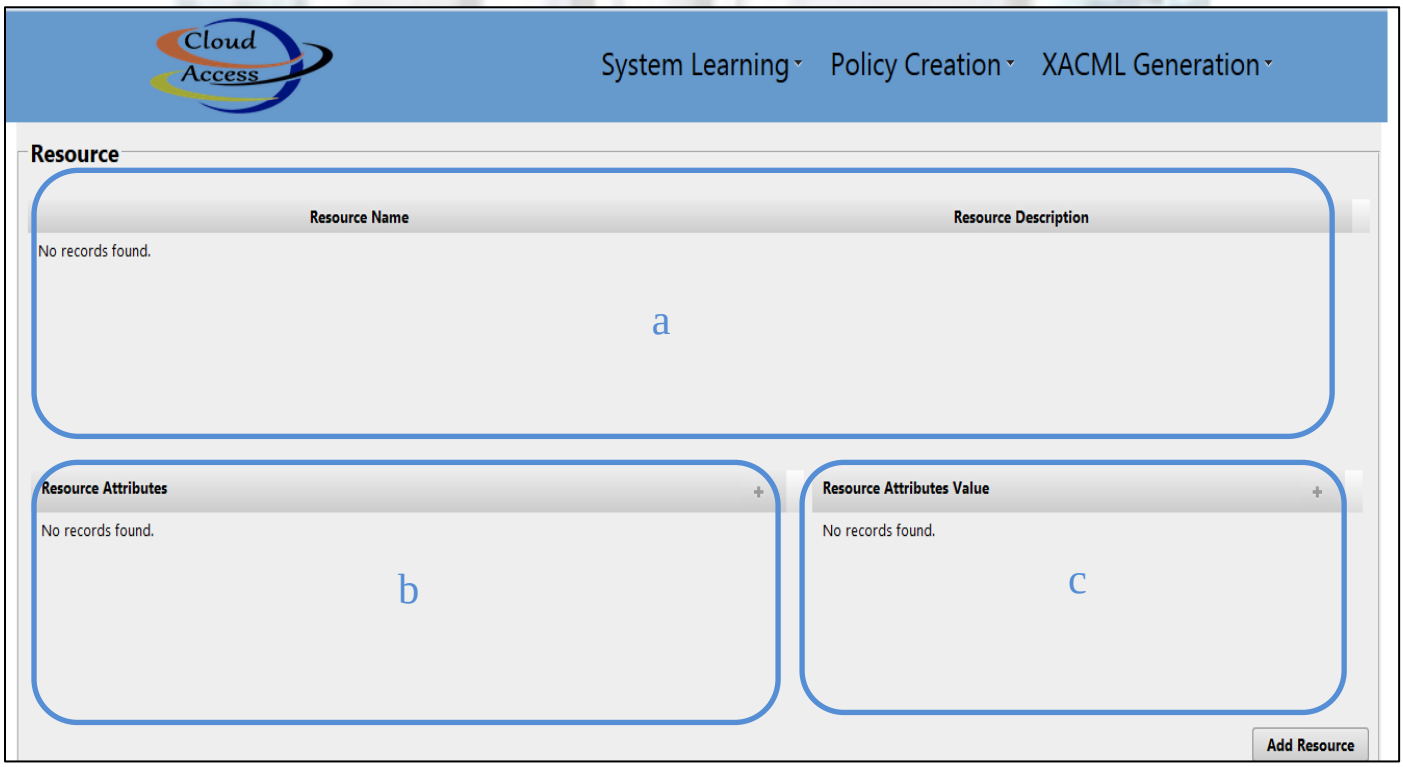
This section demonstrates how to create, update and delete the Resource parameter in 'System Learning' phase.

MR- 1: Create Resource

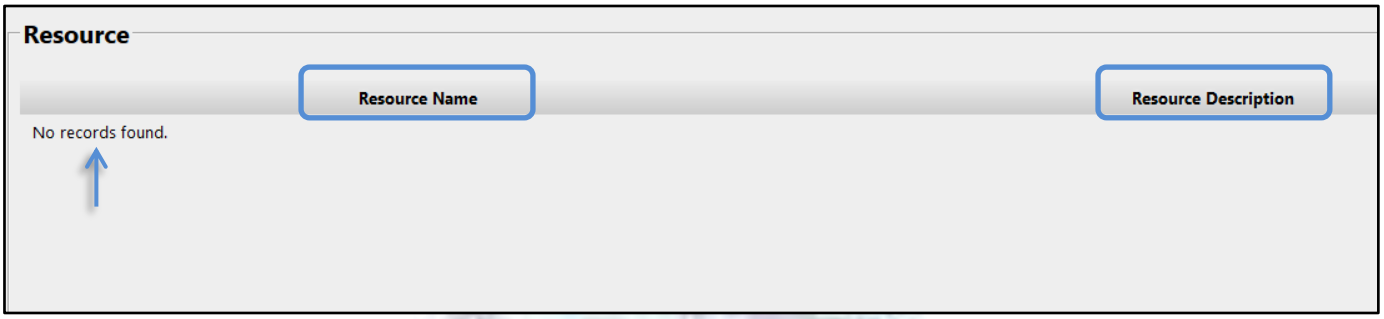
1. In order to create Resource, select the **Resource** option from dropdown list as depicted below.



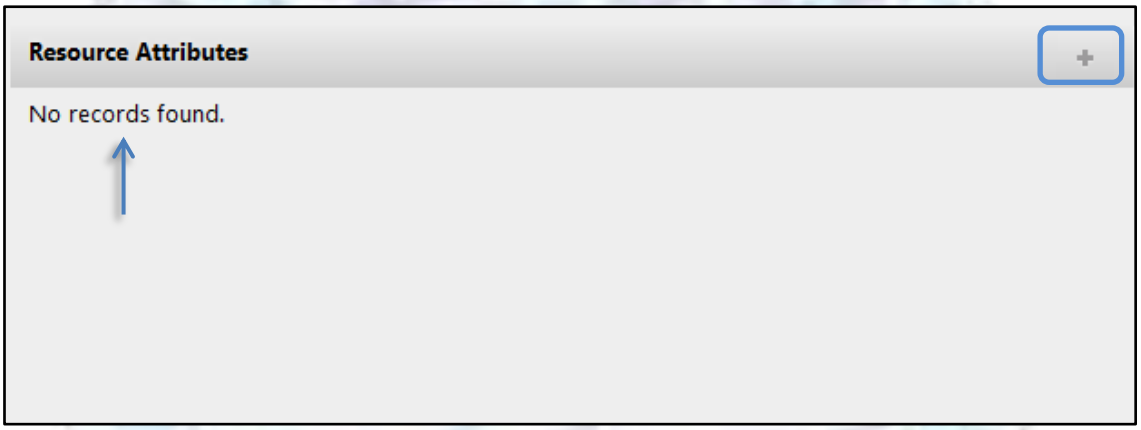
2. After selecting the **Resource** option in previous step, the following **Resource** interface is displayed to add the new Resource. This interface further includes three main portions as highlighted with "a", "b" and "c" in the below figure.



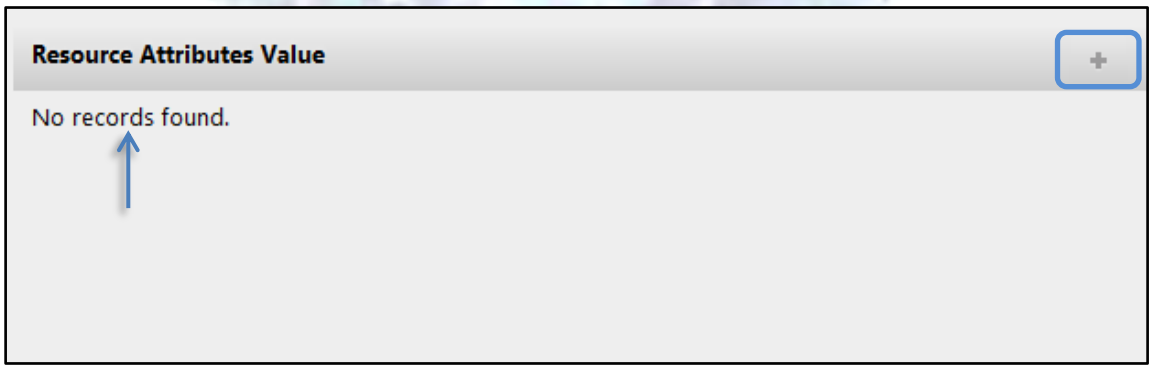
a) The first part of the **Resource** interface contains **Resource Name** and **Resource Description** tabs.



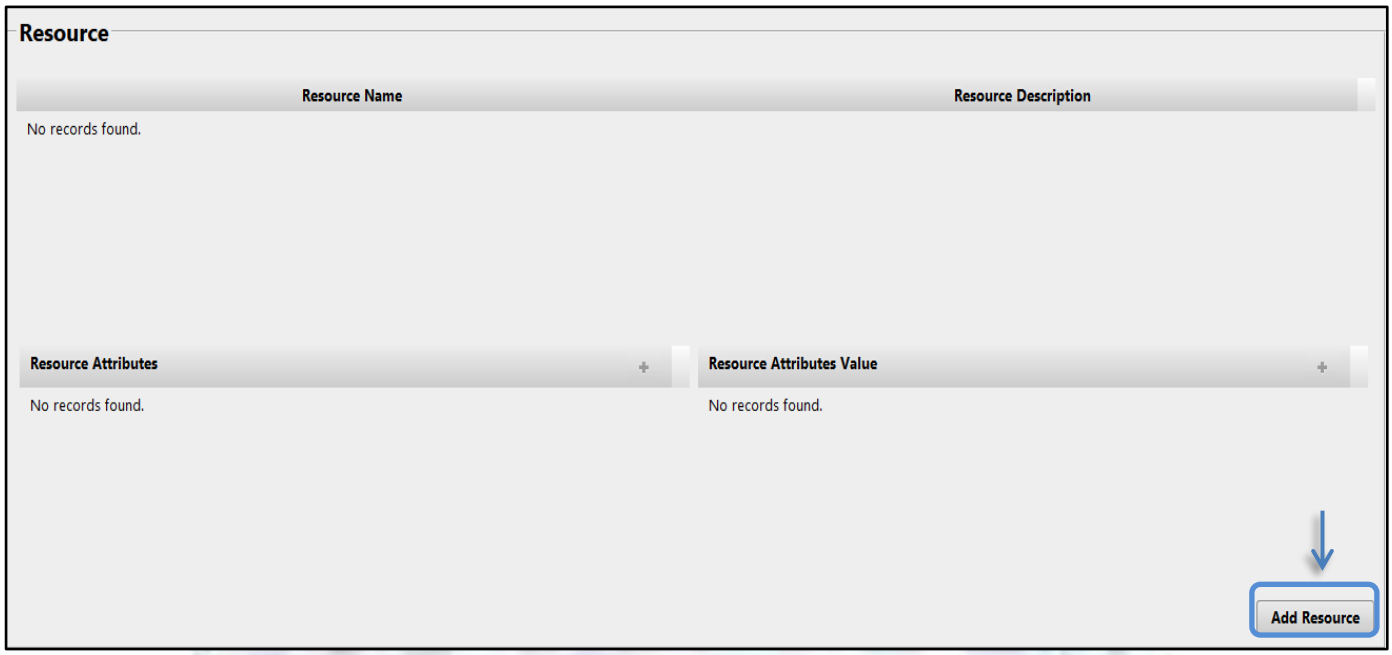
b) The second portion of this interface contains the **Resource Attributes** tab that enlists the added Attributes for a given Resource. Initially, when there are no records, the "+" button is disabled.



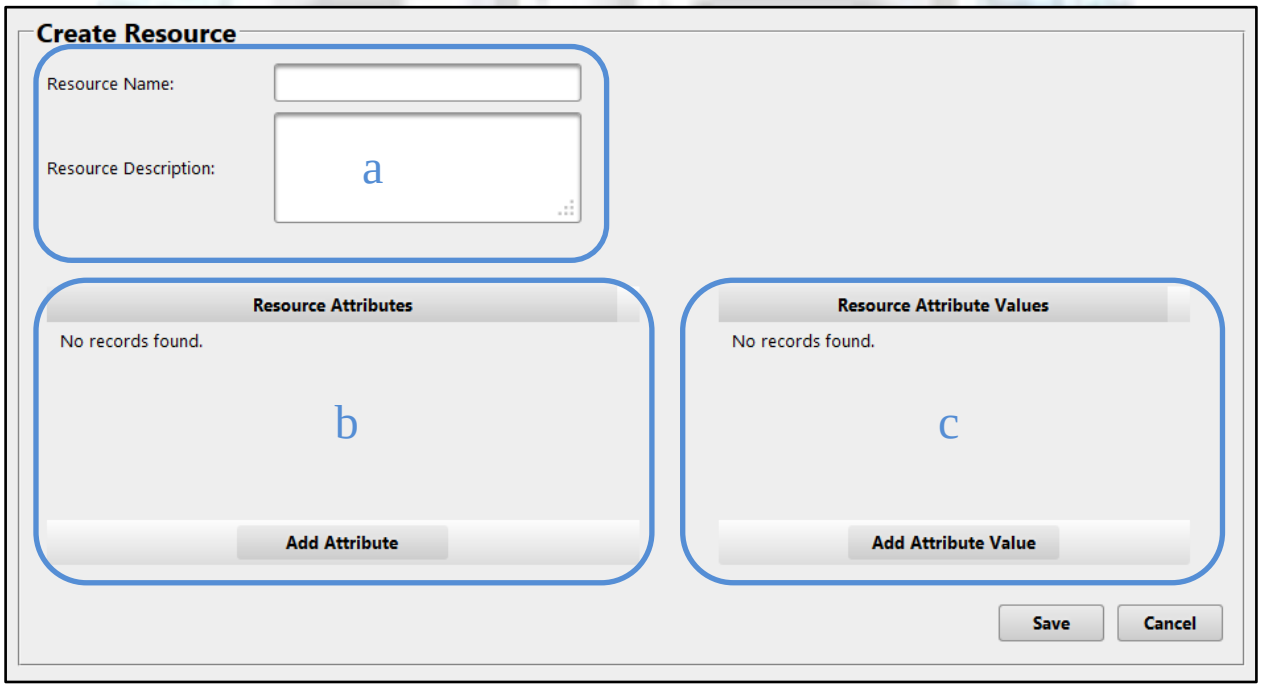
c) The third part of the interface consists of **Resource Attribute Values** tab that gives a list of different values for a specific Attribute. At the start, when no Resource, Attribute and Attribute Values are added, the "+" button is disabled.



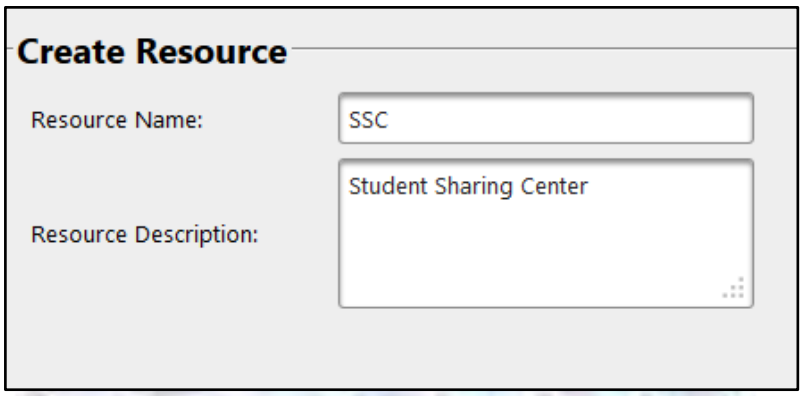
3. Click on the **Add Resource** button on the bottom right corner of the below interface.



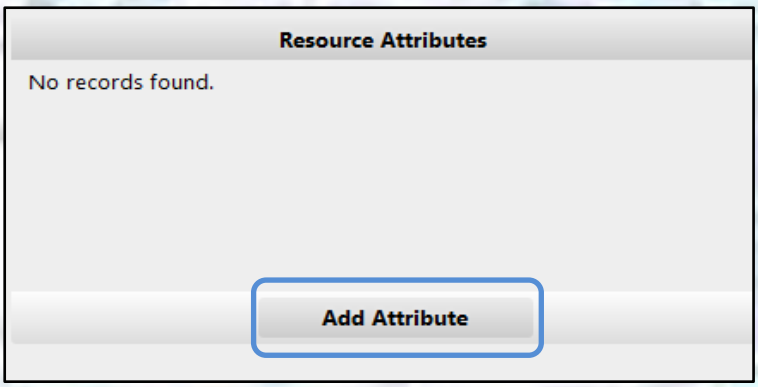
4. The **Create Resource** interface is opened to add the required number of Resources. This interface further has three main portions to add the Resource, Attributes and Attribute Values, as highlighted with "a", "b" and "c" in below figure.



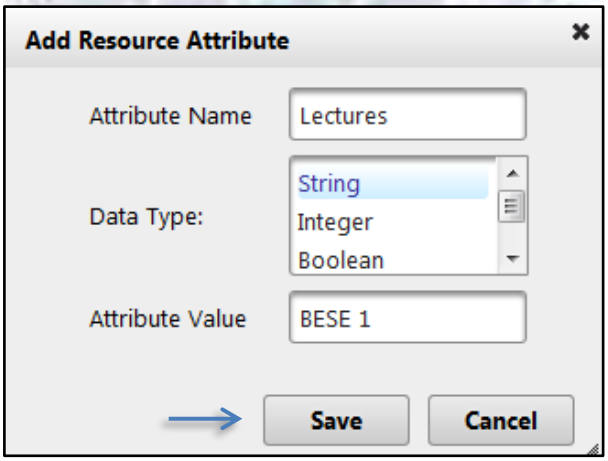
a) The first portion of the interface consists of **Resource Name** and **Resource Description** text boxes. In order to create a Resource, add the required name and description in text boxes.



b-1) The second part of the **Create Resource** interface provides the **Add Attribute** button to add the required Attributes for a particular Resource.

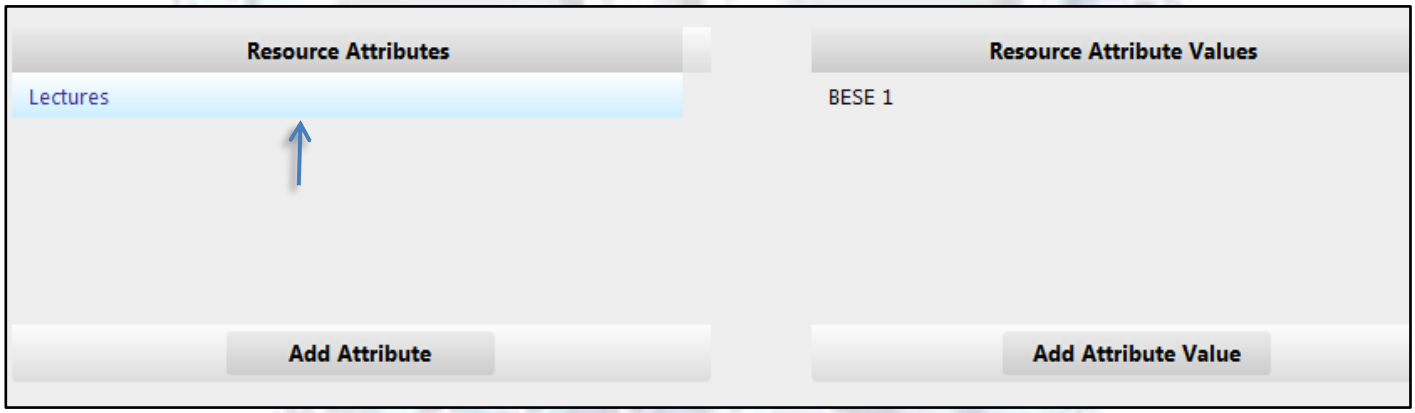


b-2) The following interface is displayed to add the required Resource Attributes. It consists of **Attribute Name**, **Data Type** and **Attribute Value** text boxes. Enter the required Attribute name, its value and select the data type from the given list. Finally click on the **Save** button as shown below.

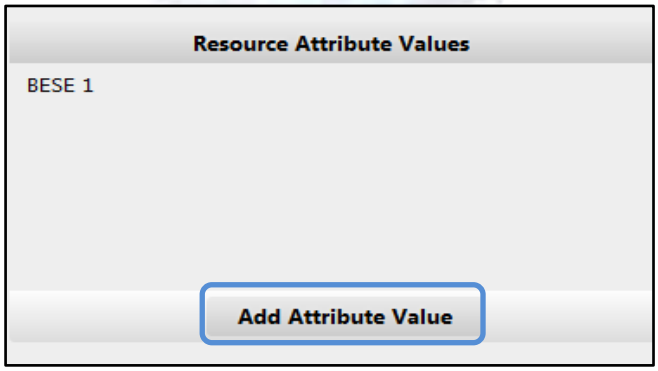


b-3) The added Attribute is displayed under the **Resource Attribute** tab as shown in below figure.

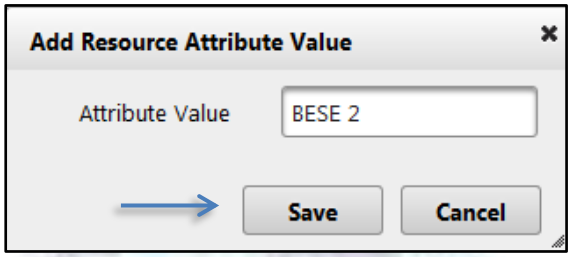
c- 1) The third part of the **Create Resource** interface consists of the **Add Attribute Value** button to add more than one value for specific Attribute. It is compulsory to select the required Attribute from the **Resource Attributes** before adding the values. If the **Add Attribute Value** button is clicked without selecting any Attribute, a warning message is popped out to first select the desired Attribute.



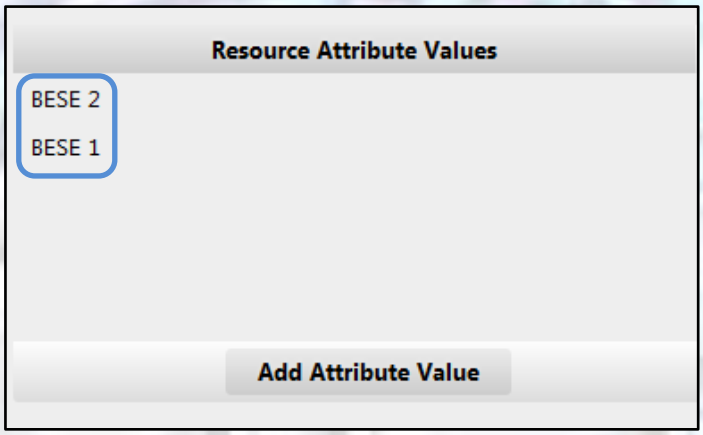
c- 2) Click on the **Add Attribute Value** button to add a new value for the selected Attribute of Resource.



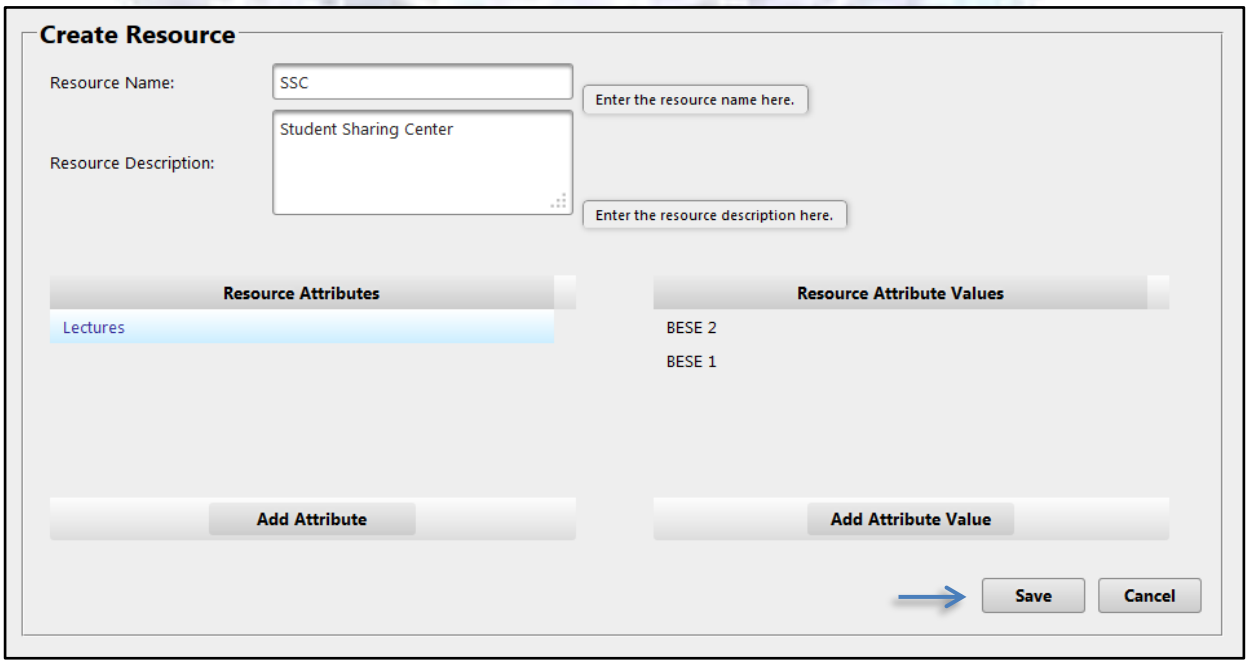
c- 3) The following window appears on the screen containing the **Attribute Value** text box. Enter the required value for Attribute and then click on **Save** button as shown in below figure.



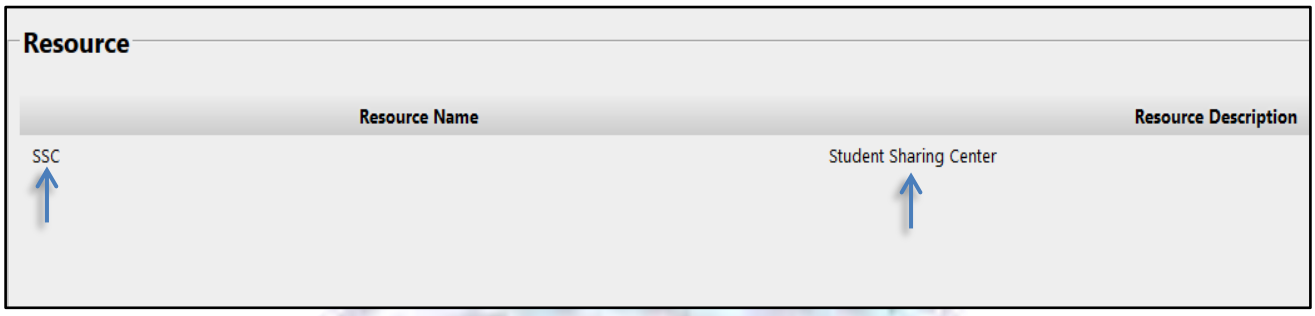
c- 4) After saving the Attribute value, the following two values are visible under the **Resource Attribute Values** tab as shown in below figure.



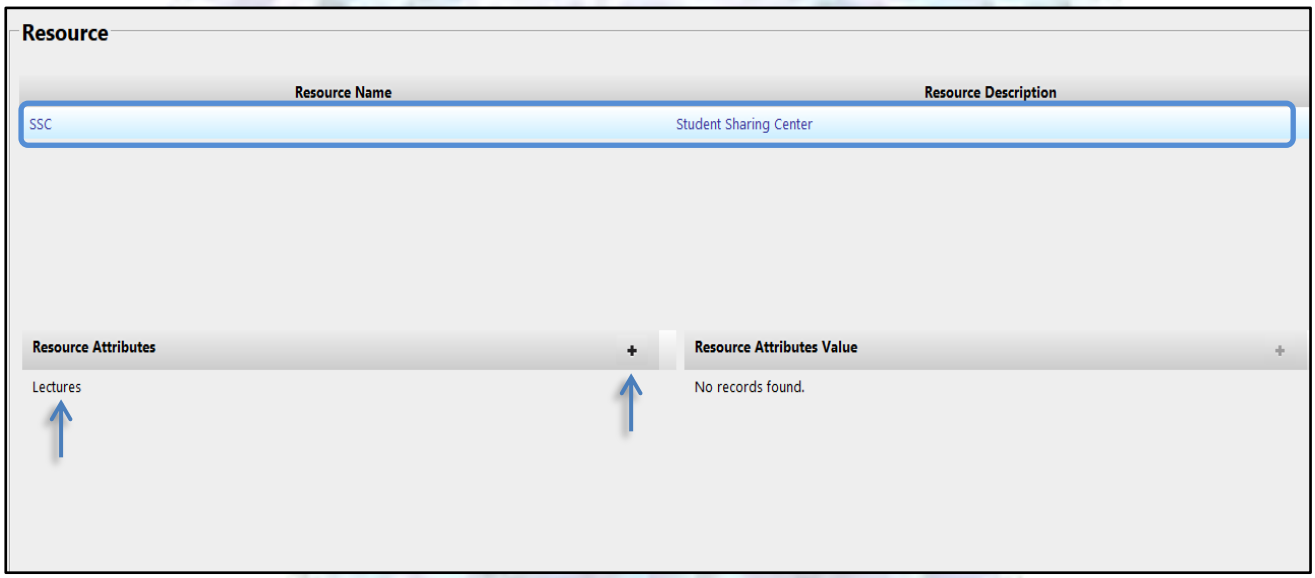
5. Now click on the **Save** button in the **Create Resource** interface to save the added Resource in database.



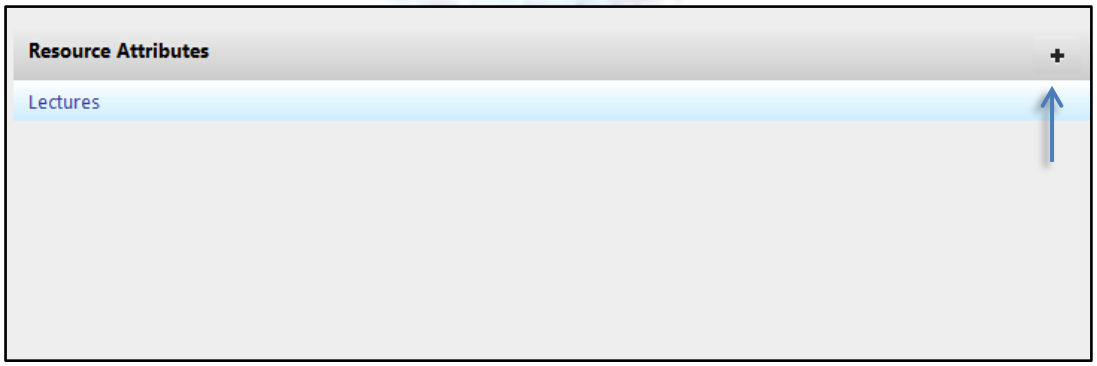
6. The added Resource is displayed on **Resource** interface with its values under the **Resource Name** and **Resource Description** tabs as shown in below figure.



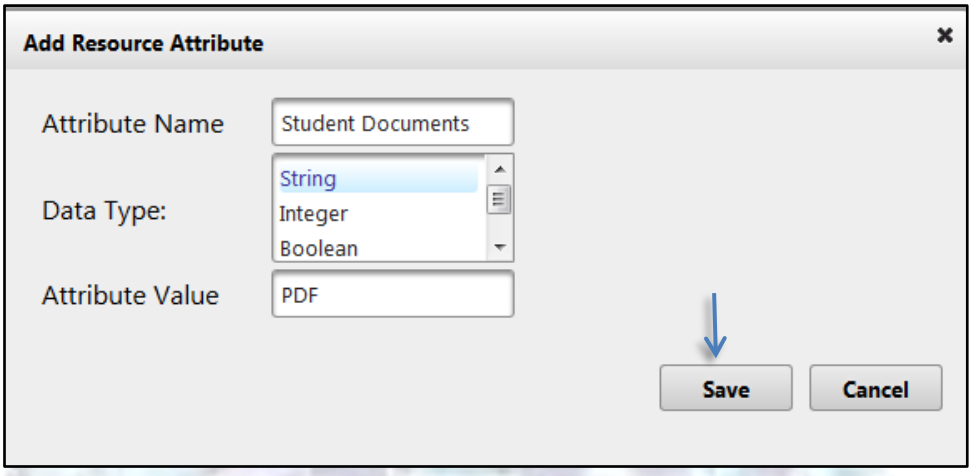
7. Click on the new added line of Resource, it displays the Attributes of the Resource under the **Resource Attribute** tab as well as the "+" sign is also enabled to add more Attributes for the selected Resource.



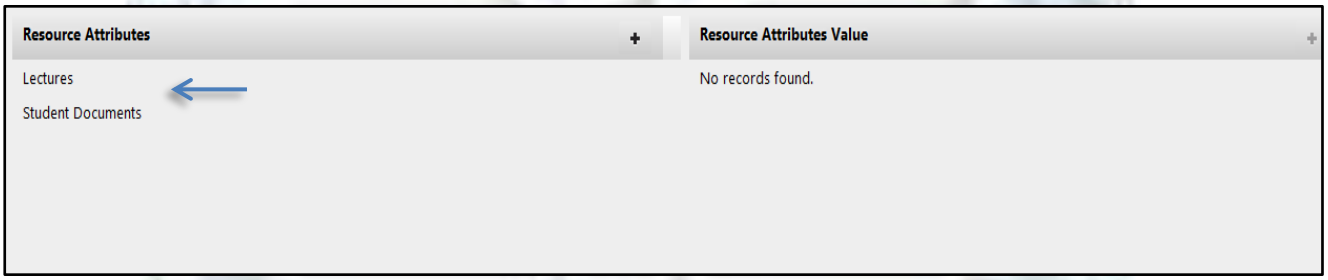
8. In order to add more Resource Attributes, click on the "+" button as shown below.



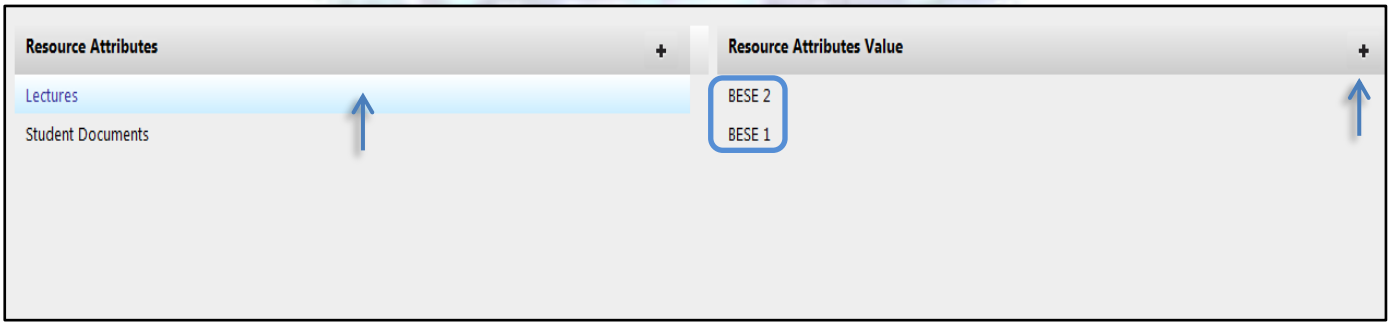
9. Add the required values for **Attribute Name**, **Data Type** and **Attribute Value** and then click on **Save** button.



10. Now two different Resource Attributes are visible under the **Resource Attribute** tab as shown in figure below.

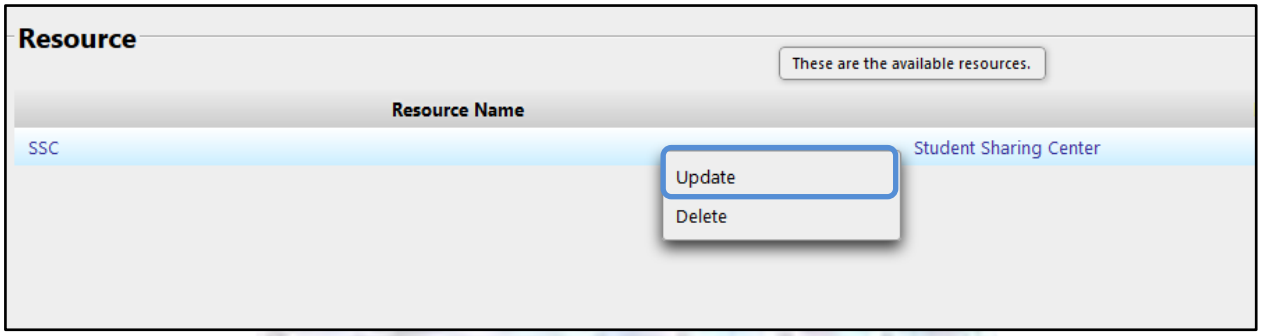


11. In order to view the values for specific Attributes, click on the required Attribute. It also enables the "+" button as shown below. By clicking on "+" button more Attribute Values can be added to the selected Attribute.

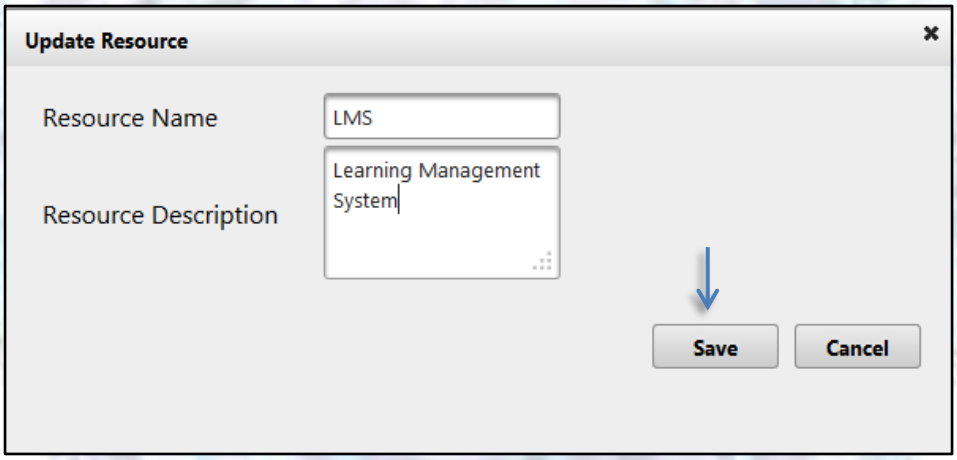


MR- 2: Update Resource

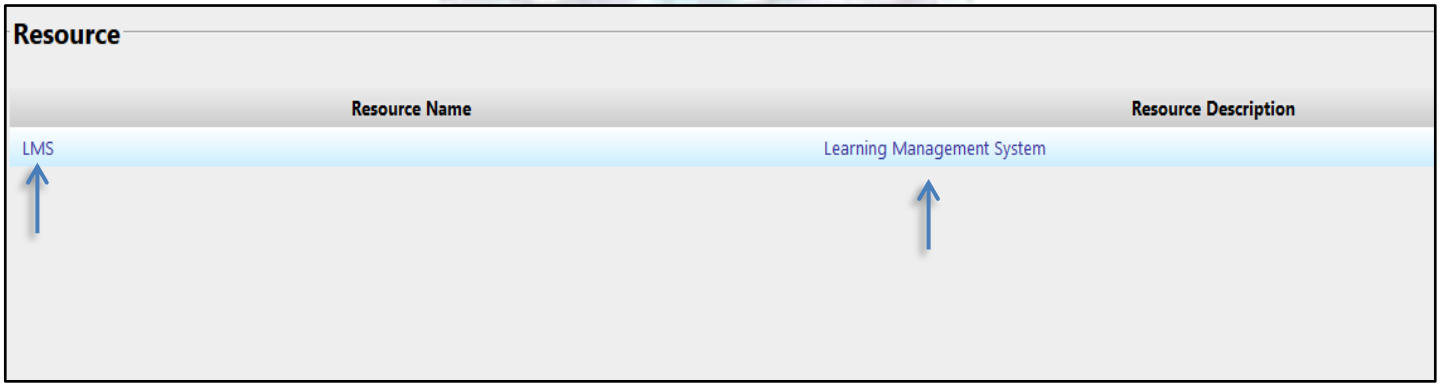
1. To update an added Resource, right click on that specific Resource in **Resource** interface and then select the **Update** option form the menu as depicted in below figure.



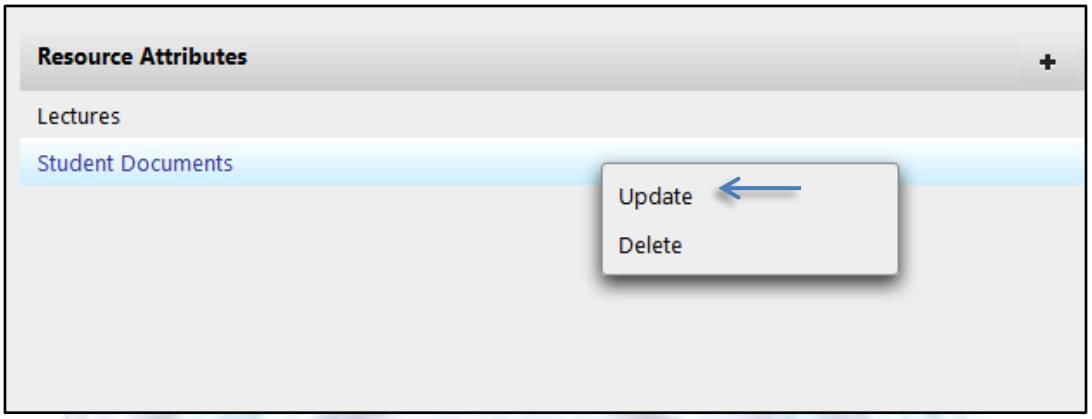
2. The following interface appears after selecting the **Update** option in previous step. You can update any of the two values which include **Resource Name** or **Resource Description**. After updating the required fields, click on the **Save** button.



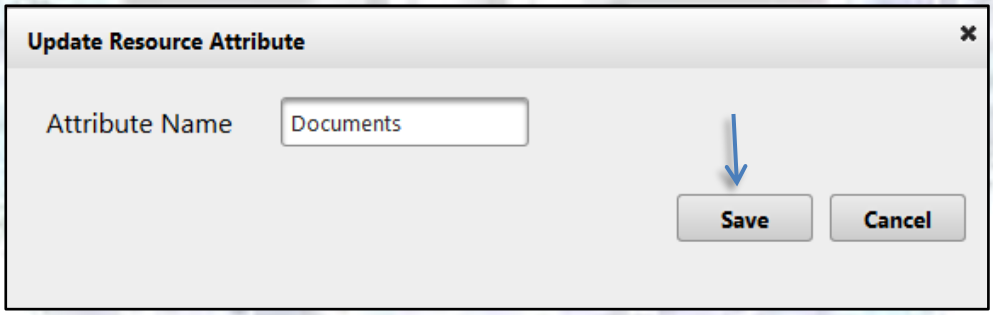
3. The updated results are visible on the main **Resource** interface as shown below.



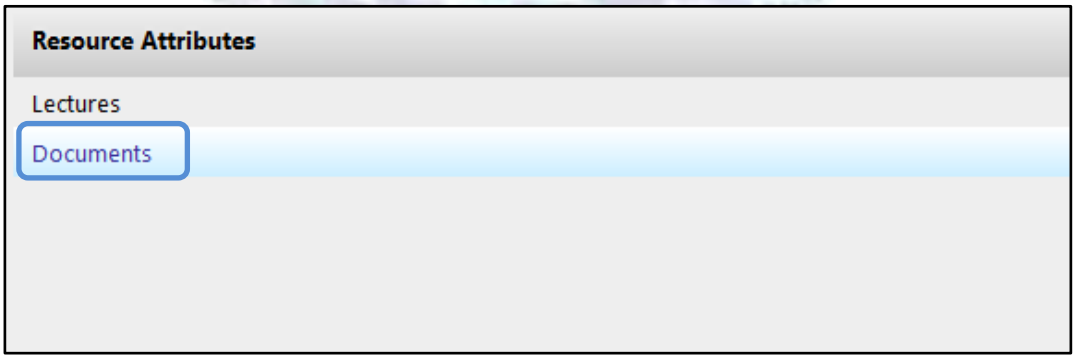
4. Similarly, any Attribute of the Resource can also be updated. Right click on the Attribute under the **Resource Attribute** tab of the main **Resource** interface. A menu appears and now select the **Update** option.



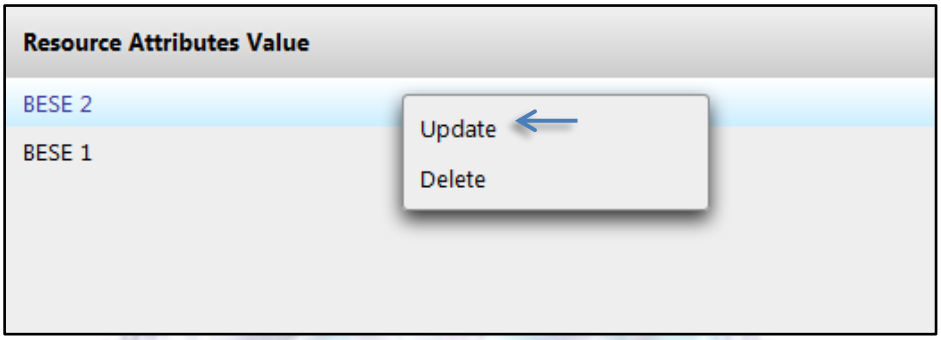
5. **Update Resource Attribute** interface is displayed on the screen. Enter the required name in the **Attribute Name** text box and click on **Save** button.



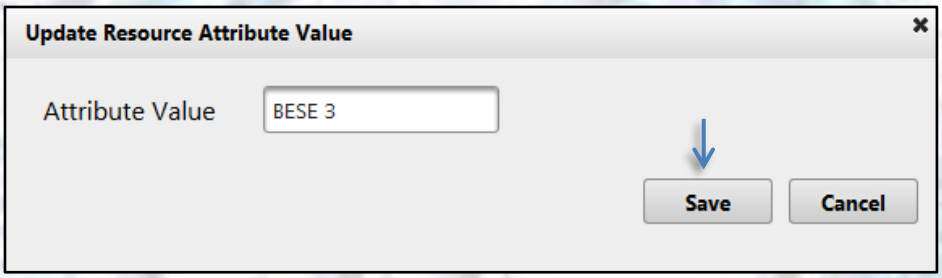
6. The updated results for the particular Attribute appears under the **Resource Attribute** tab on main **Resource** interface.



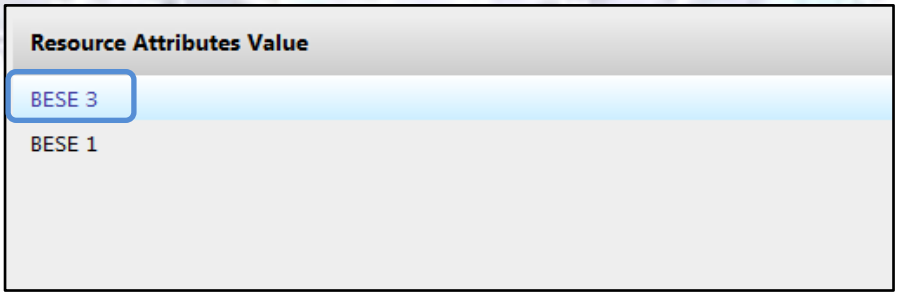
7. Similarly, the Values for Attribute can also be updated. Right click on the name of the Attribute Value under **Resource Attribute Value** tab. Now select the **Update** option from the dropdown list.



8. The following window is appeared. Enter the new required value for Attribute and then click on **Save** button.

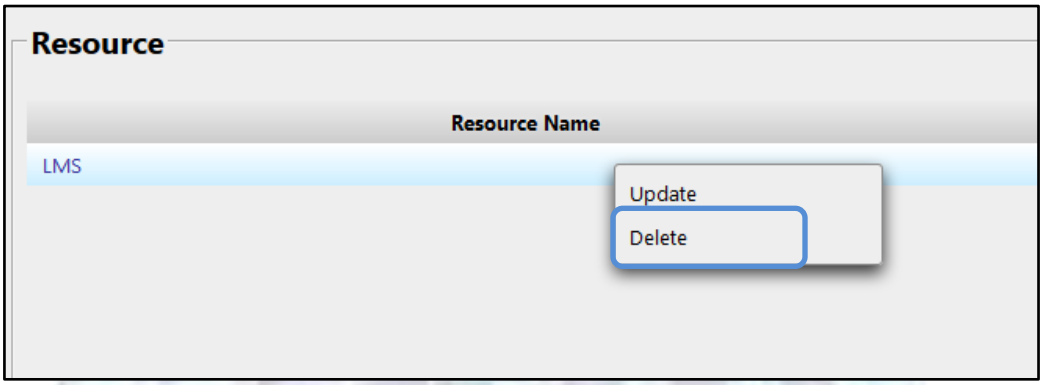


9. The updated value for the Resource Attribute is displayed instead of the previous value as shown below.

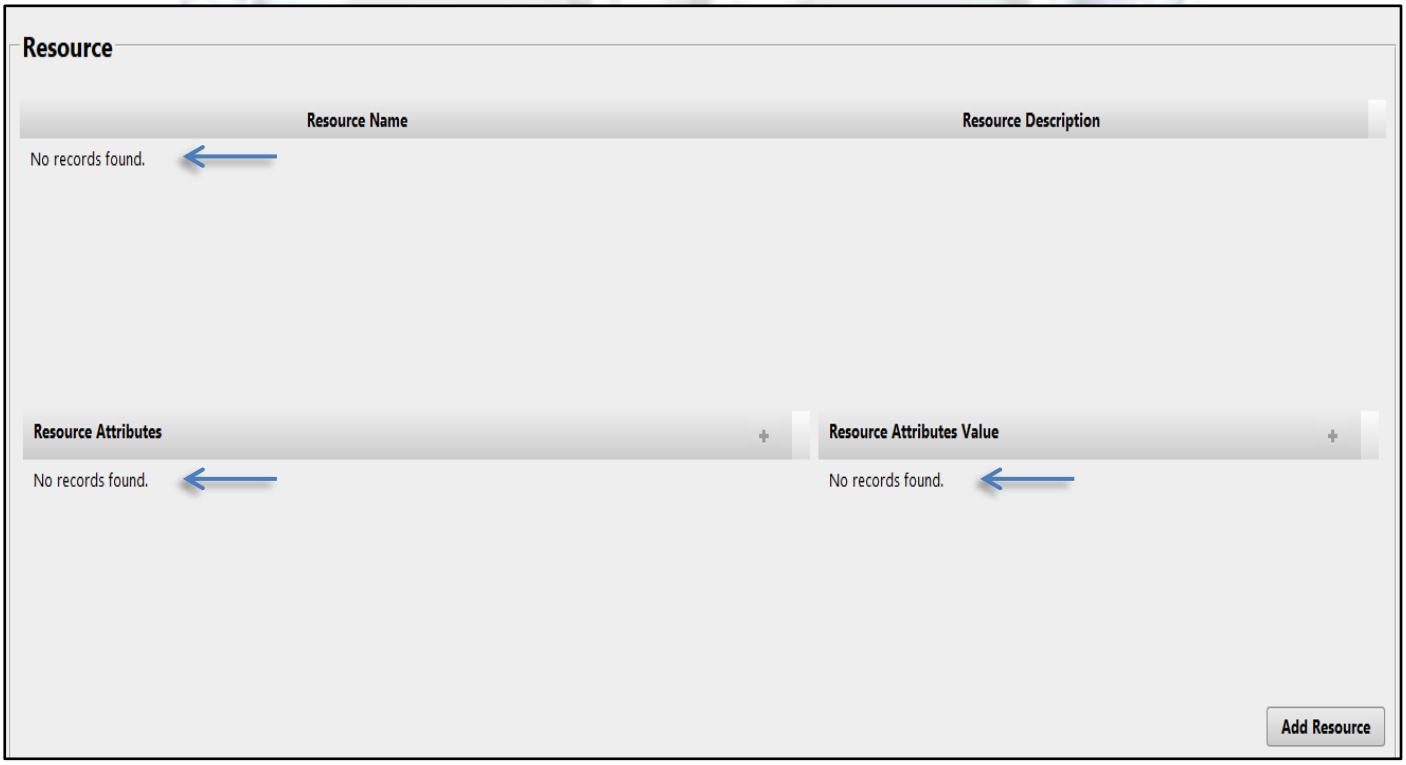


MR- 3: Delete Resource

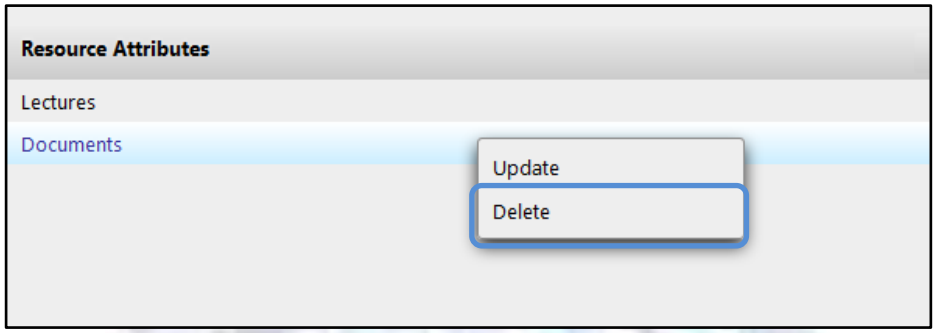
1. Right click on the name of that Resource in main **Resource** interface. Select the **Delete** option from the dropdown list.



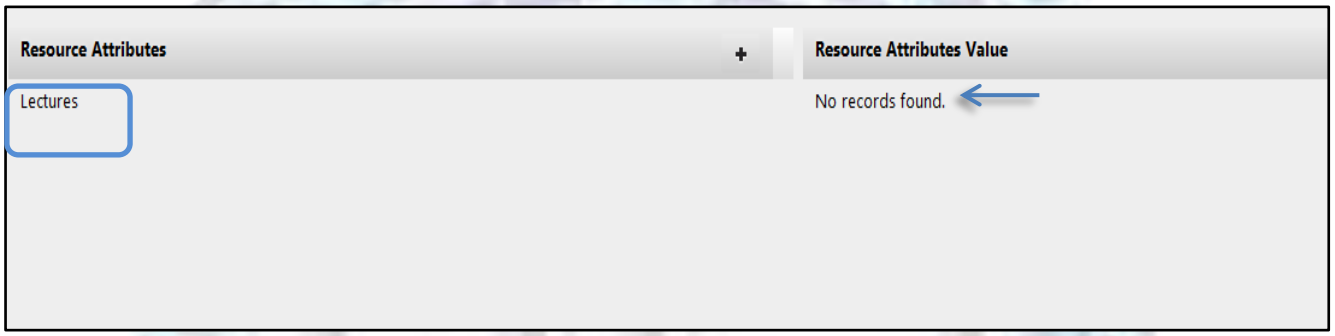
2. The selected Resource is deleted as shown in below figure. The **Resource Attributes** and **Resource Attribute Values** are also deleted for that specific Resource.



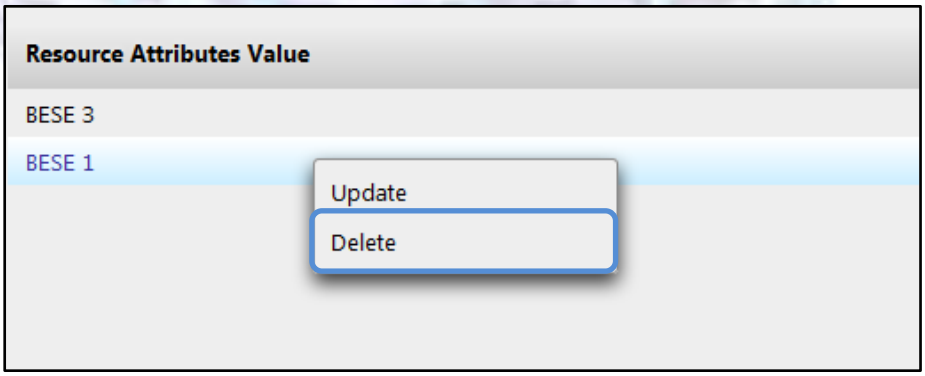
3. In order to delete an Attribute of particular Resource, right click on that Attribute under **Resource Attribute** tab on the main **Resource** interface. Click on the **Delete** option from the dropdown list.



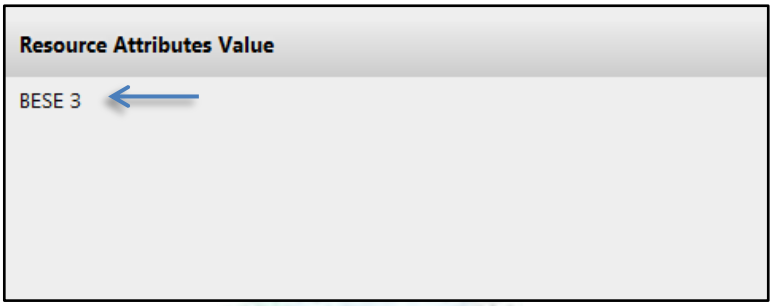
4. The selected Attribute is deleted along with all of its Attribute Values as shown in below figure.



5. To delete a particular Attribute Value, right click on that value under the **Resource Attribute Value** tab and click on the **Delete** option.



6. The selected Attribute value is deleted as shown in below figure.

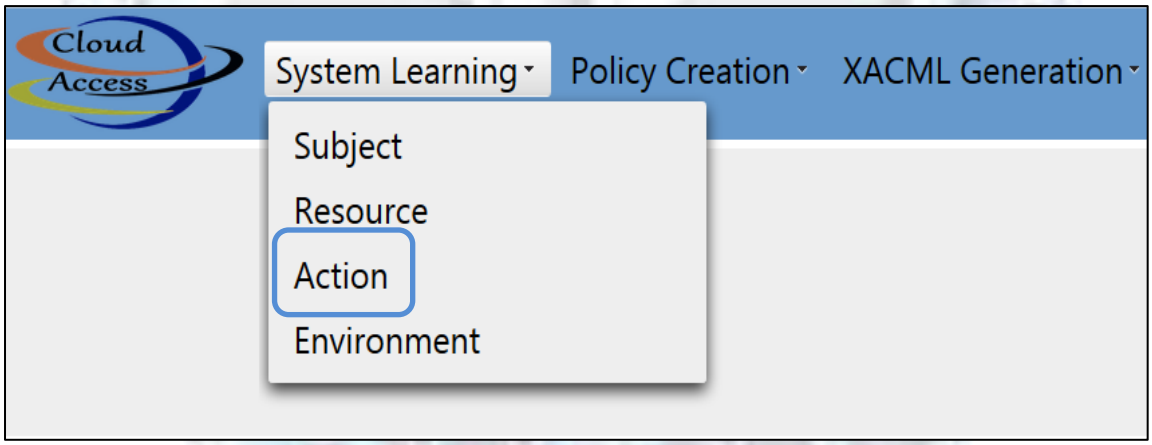


SL- 3: Manage Action

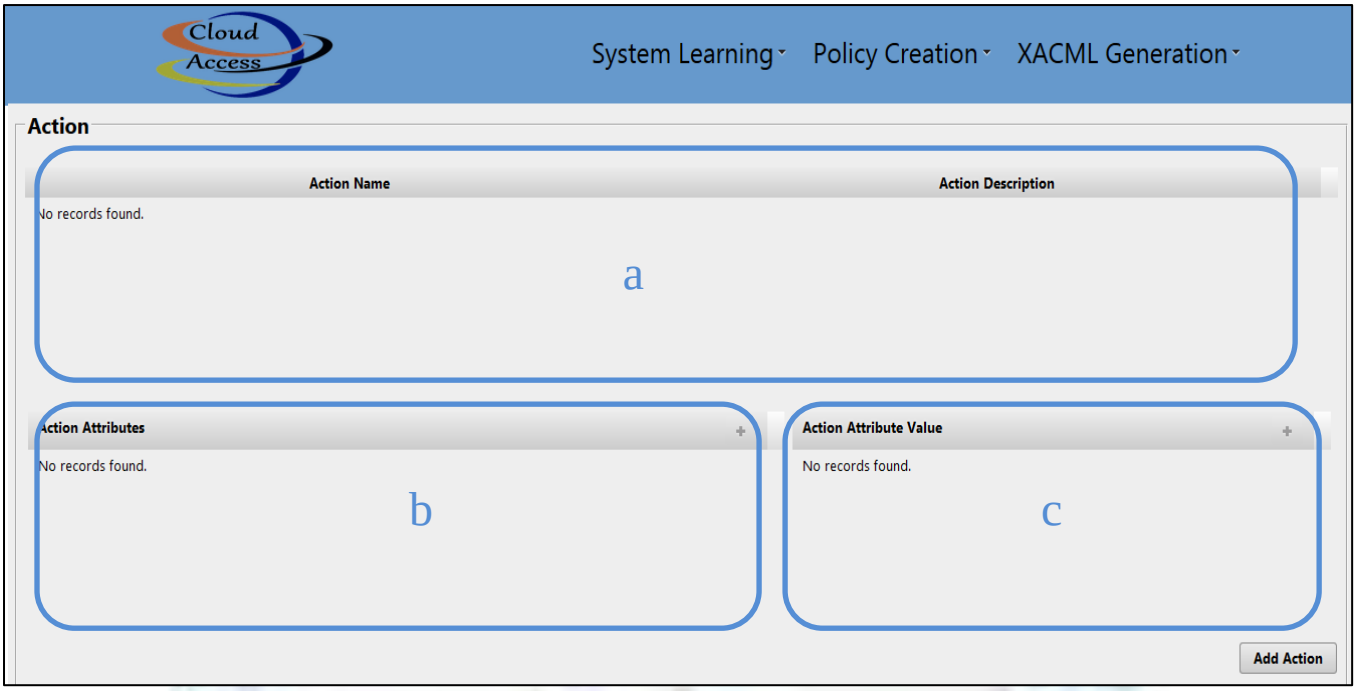
This section demonstrates how to create, update and delete the Action parameter in 'System Learning' phase.

MA- 1: Create Action

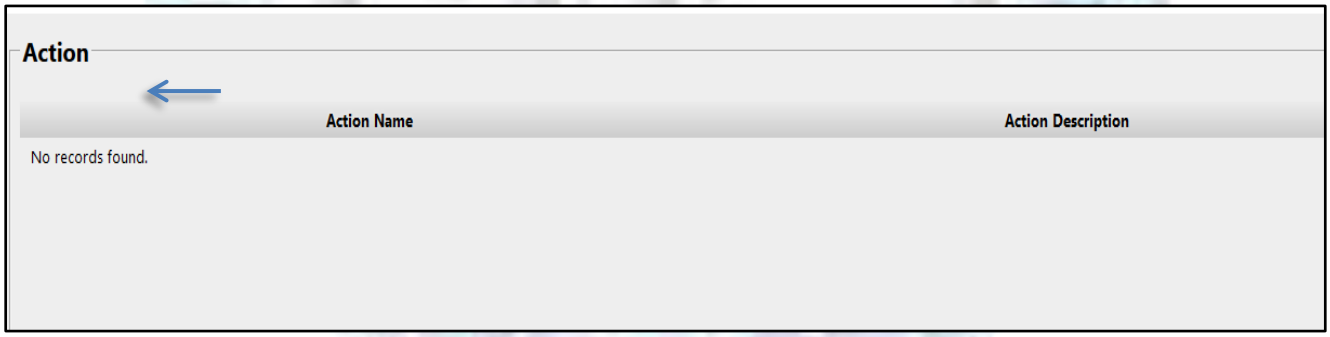
1. In order to create Action, select the **Action** option from dropdown list as depicted below.



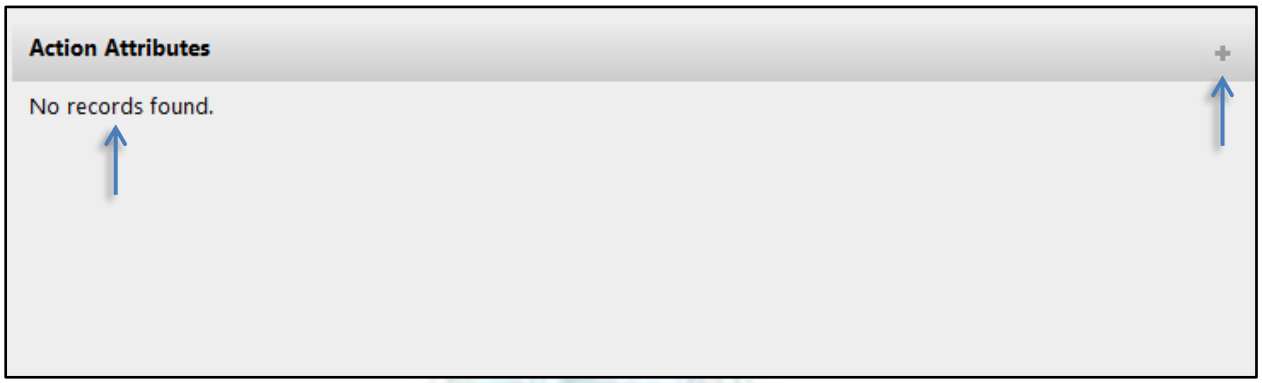
2. After selecting the **Action** option in previous step, the following **Action** interface is opened. This interface further includes three main portions as highlighted with "a", "b" and "c" in the below figure.



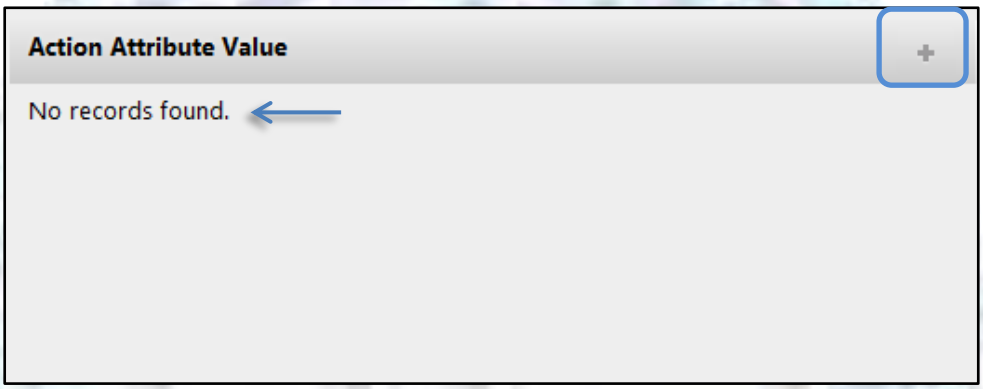
a) The upper portion of the **Action** interface contains **Action Name** and **Action Description** tabs.



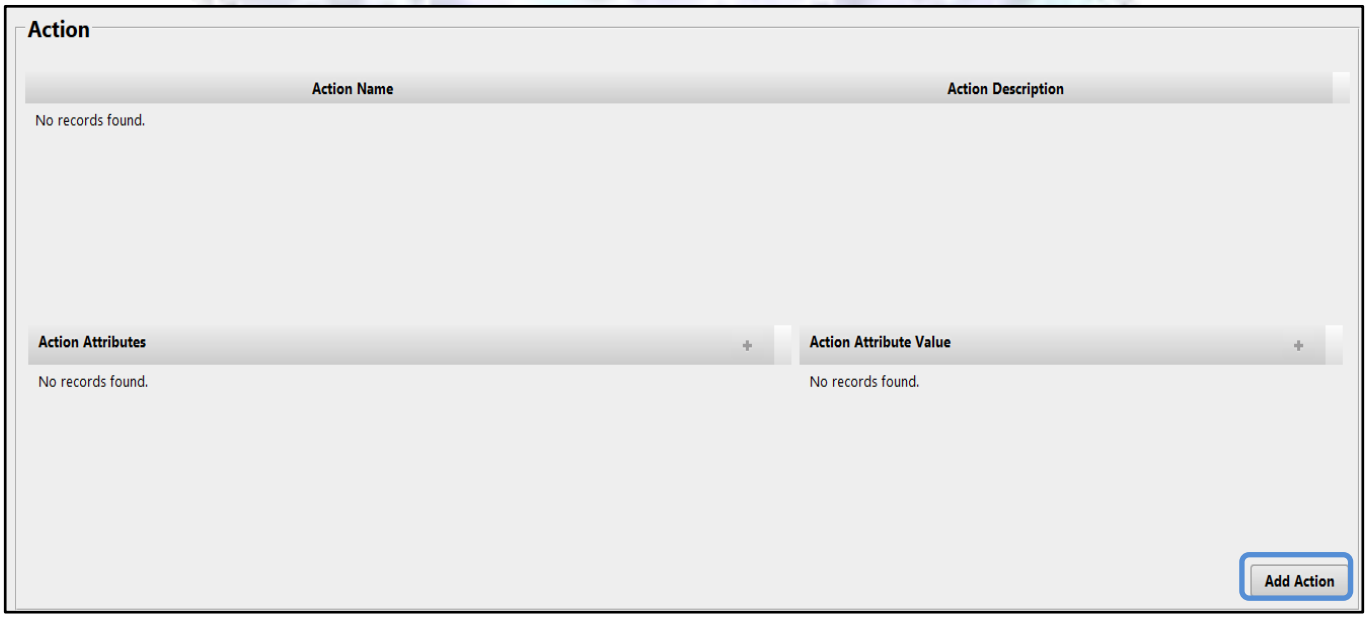
b) The second portion of this interface contains the **Action Attributes** tab that enlists the added Attributes for a given Action. Initially, when there are no records in the database, the "+" button is disabled.



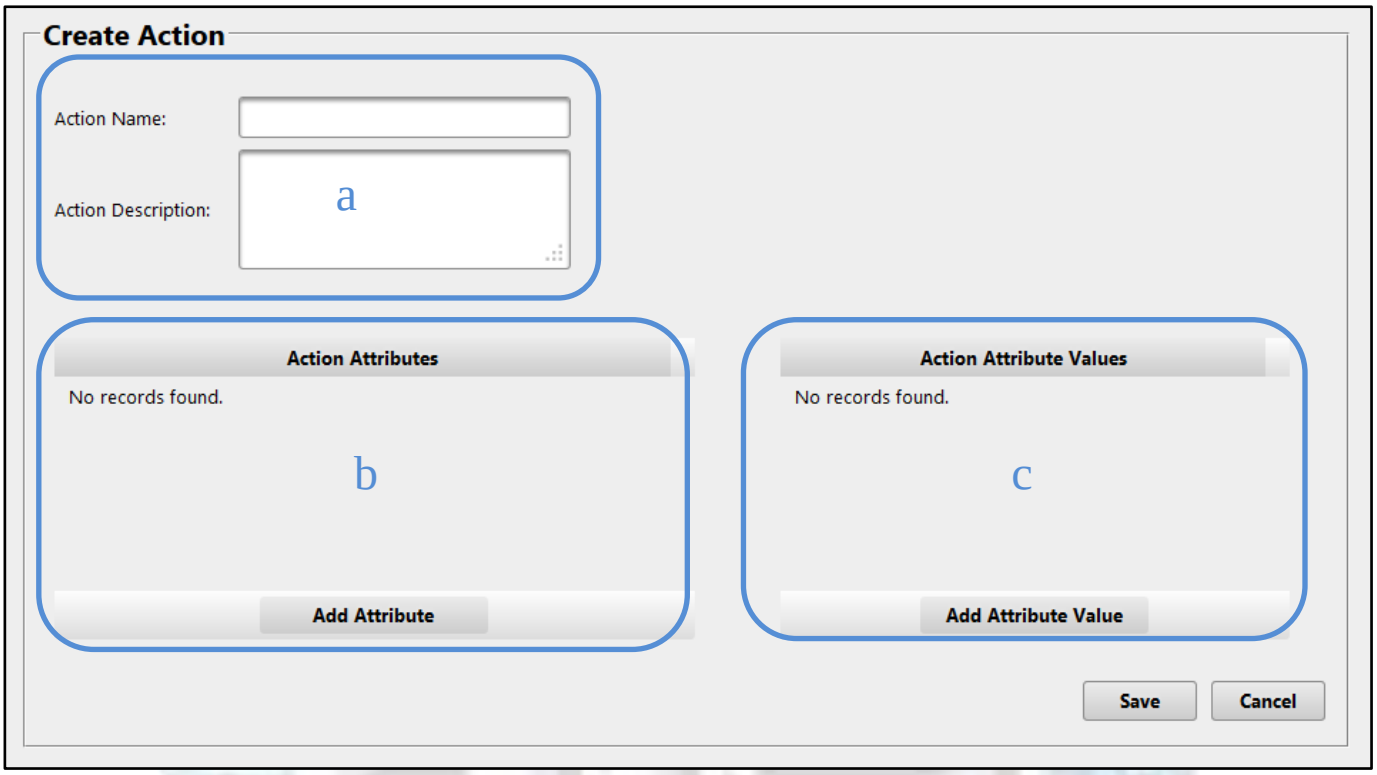
c) The third part of the interface consists of **Action Attribute Values** tab that gives a list of different values for a specific Attribute. When there is no Action added, the "+" sign is disabled.



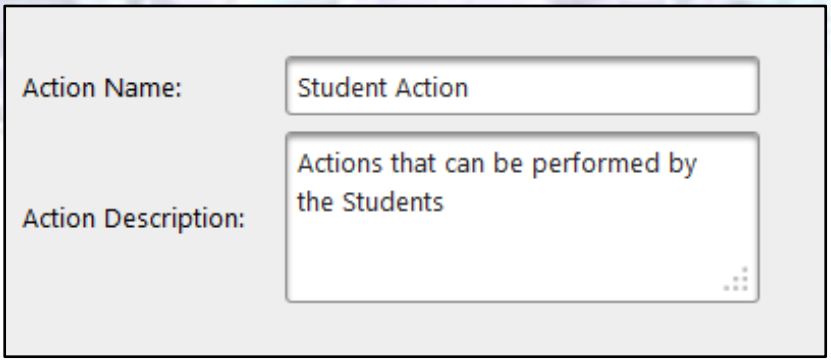
3. Click on the **Add Action** button on the bottom right corner of the below interface.



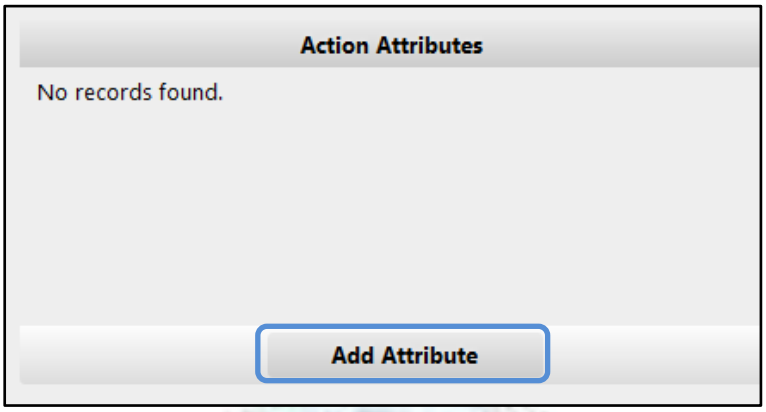
4. The **Create Action** interface is opened to add the required number of Actions. This interface further has three main portions to add the Action , its Attributes and Attribute Values, as highlighted with “a”, “b” and “c” in figure below.



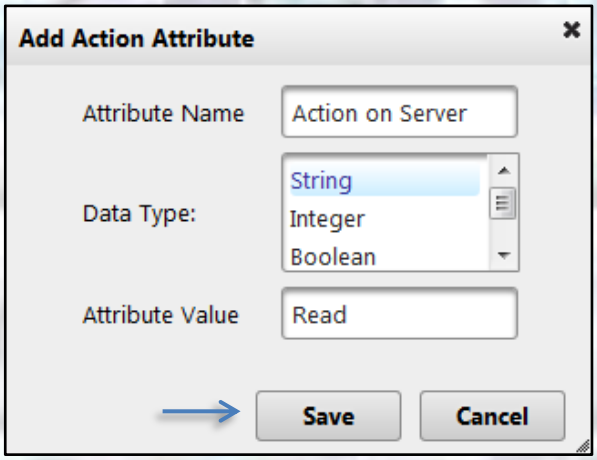
a- 1) The first portion of the interface consists of **Action Name** and **Action Description** text boxes. Add the required name and description in text boxes as shown below.



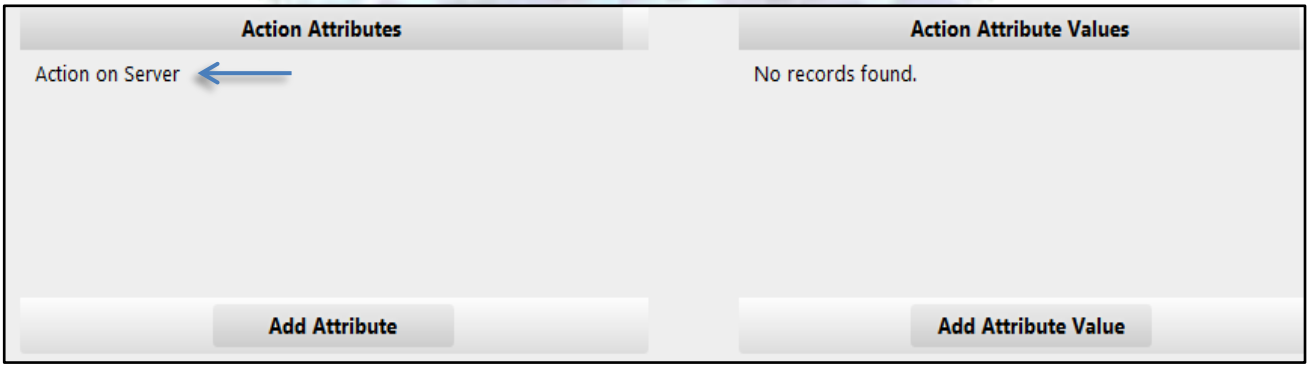
b-1) The second portion of the **Create Action** interface provides the **Add Attribute** button to add the required Attributes to the Action.



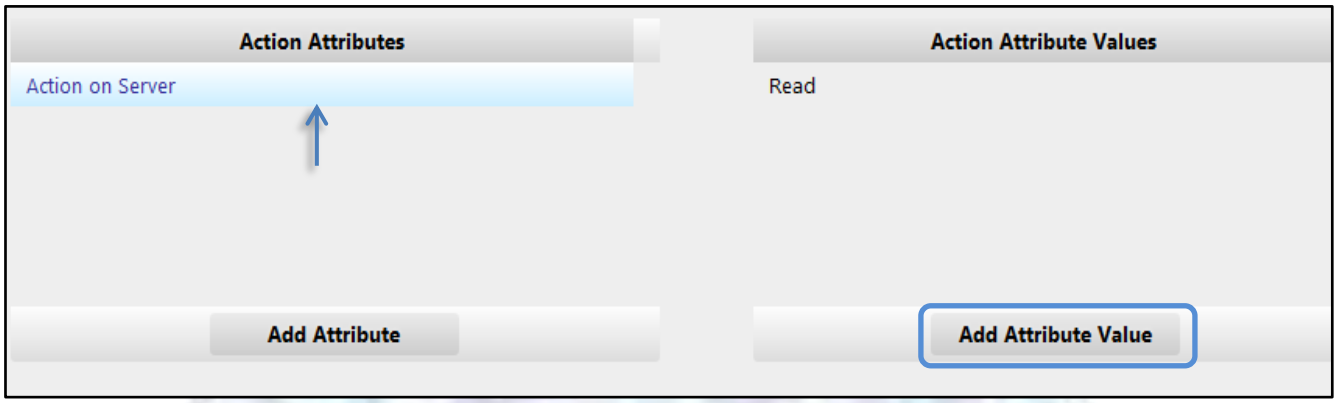
b-2) The following interface is opened to add the required Action Attributes. It consists of **Attribute Name**, **Data Type** and **Attribute Value** text boxes. Enter the required Attribute name, its Value and select the data type from the given list. Finally click on the **Save** button as shown below.



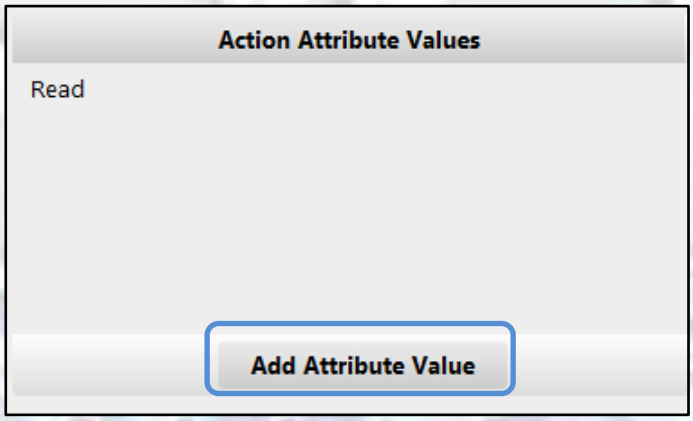
b-3) The added Attribute is displayed under the **Action Attribute** tab as shown in below figure.



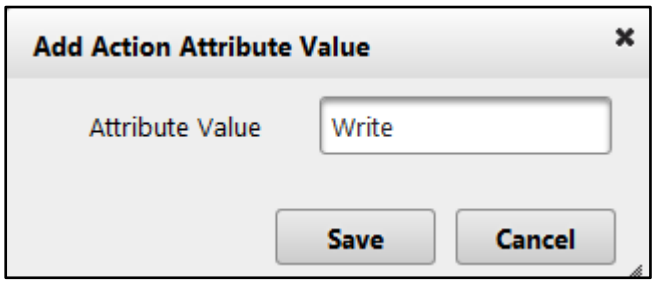
c- 1) The third part of the **Create Action** interface consists of the **Add Attribute Value** button to add more than one value for specific Attribute. It is compulsory to select the required Attribute from the **Action Attributes** before adding the values. If the **Add Attribute Value** button is clicked without selecting any Attribute, a warning message is popped out to first select the Attribute.



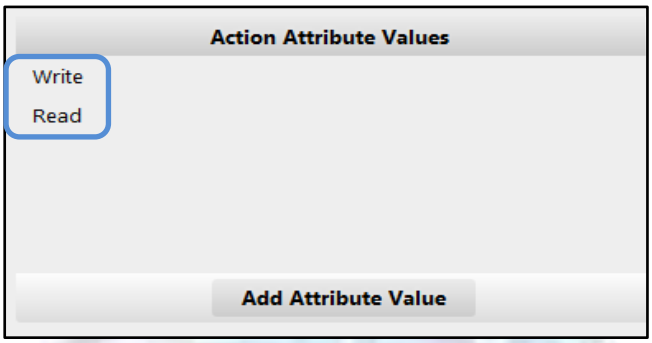
c- 2) Click on the **Add Attribute Value** button to add a new value for the Attribute of Action.



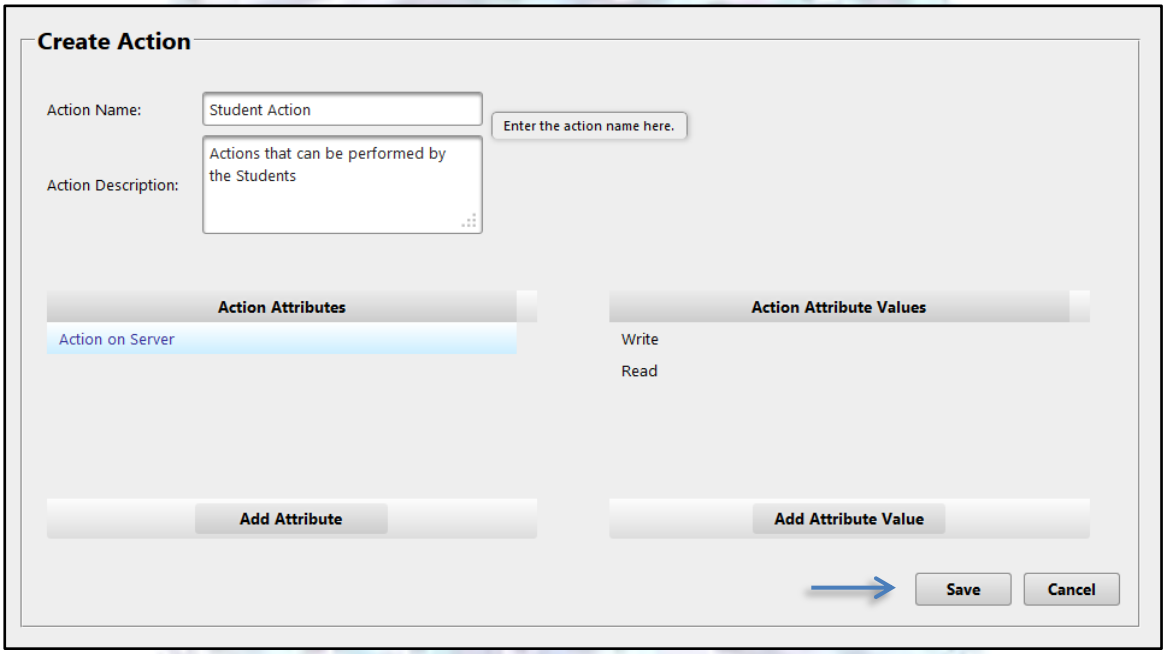
c- 3) The following window appears on the screen containing the **Attribute Value** text box. Enter the required value for Attribute and then click on **Save** button as shown in below figure.



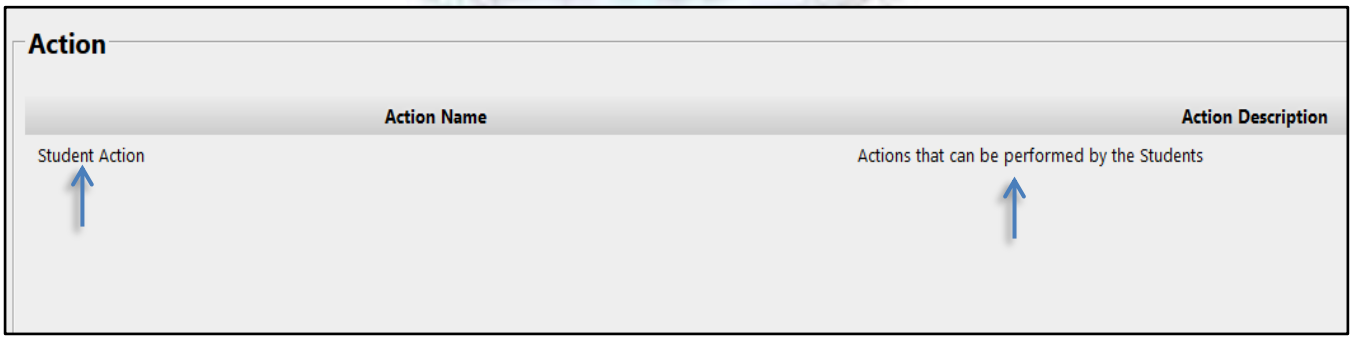
c- 4) After saving the Attribute Value, the following two values are visible under the **Action Attribute Values** tab as shown in below figure.



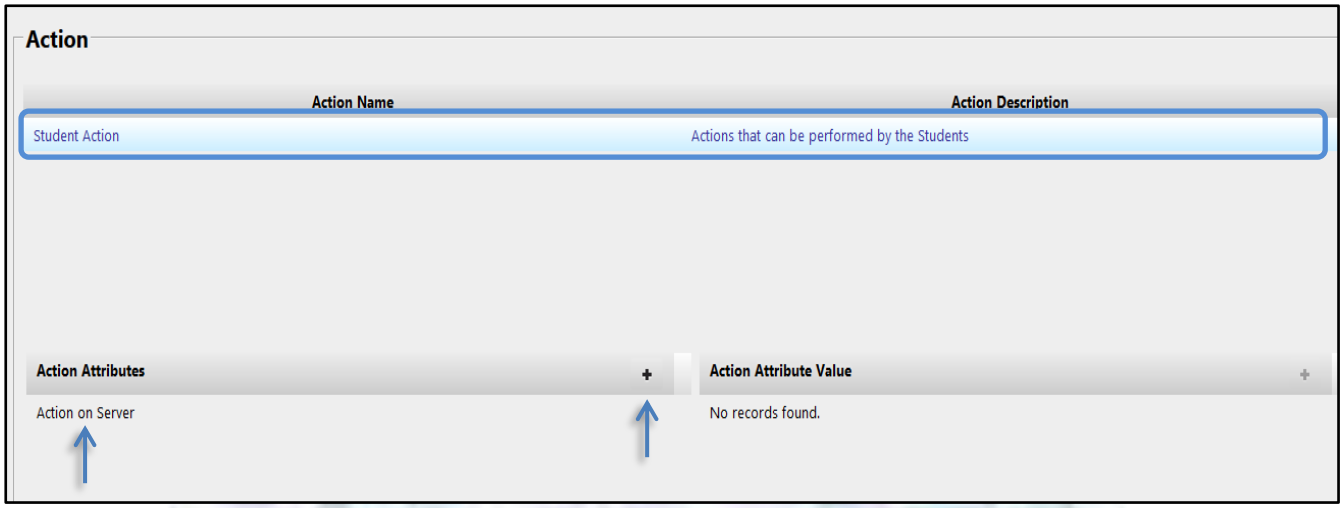
5. Now click on the **Save** button in the **Create Action** interface to save in database as shown below.



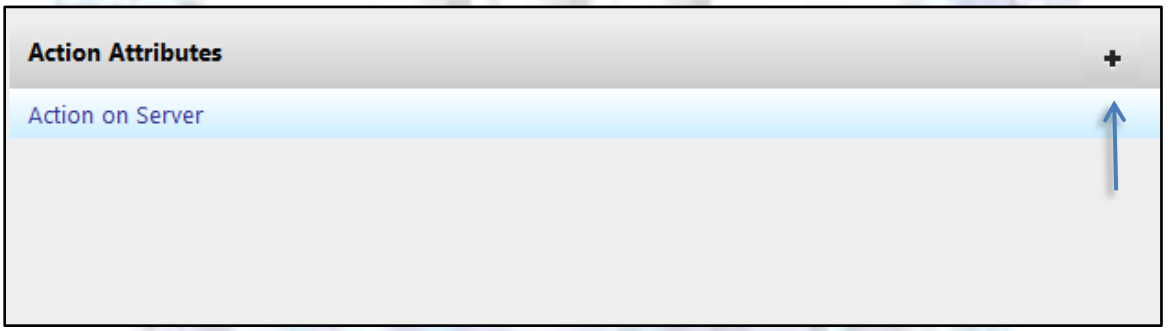
6. The added Action is displayed on **Action** interface with its values under the **Action Name** and **Action Description** tabs as shown in below figure.



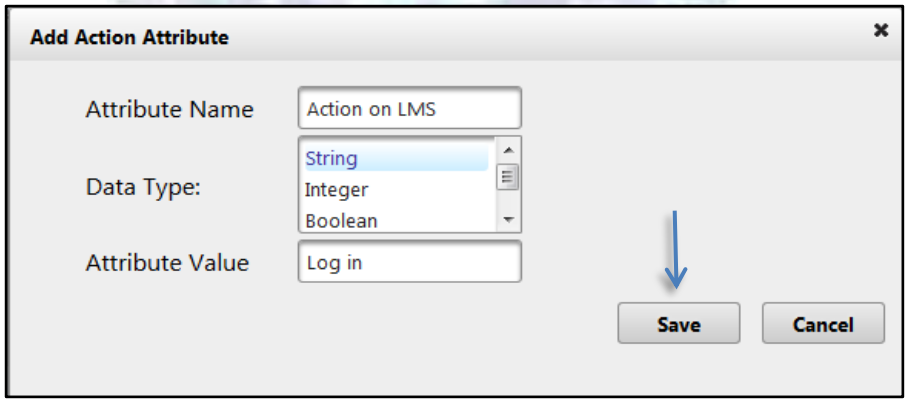
7. Now click on the newly added line of Action, it displays the Attributes of that Action under the **Action Attribute** tab as well as the "+" sign is also enabled to add more Attributes for the selected Action.



8. In order to add more Action Attributes, click on the "+" button as shown below.

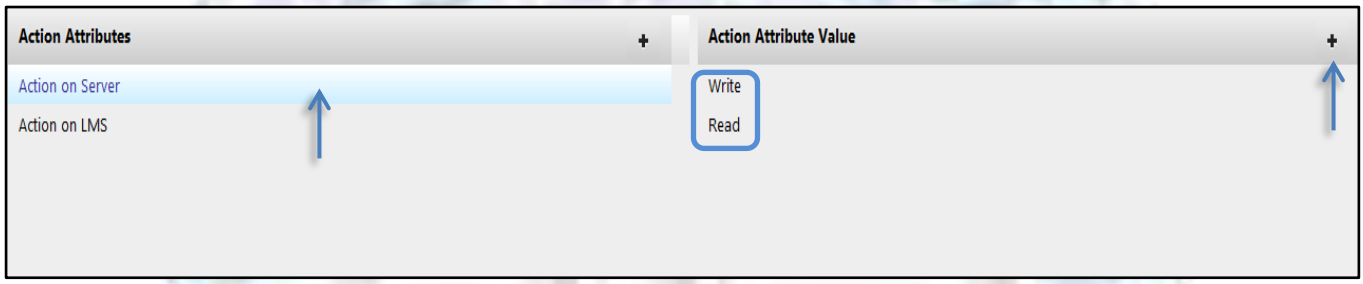


9. Add the required values for **Attribute Name**, **Data Type** and **Attribute Value** and then click on **Save** button.



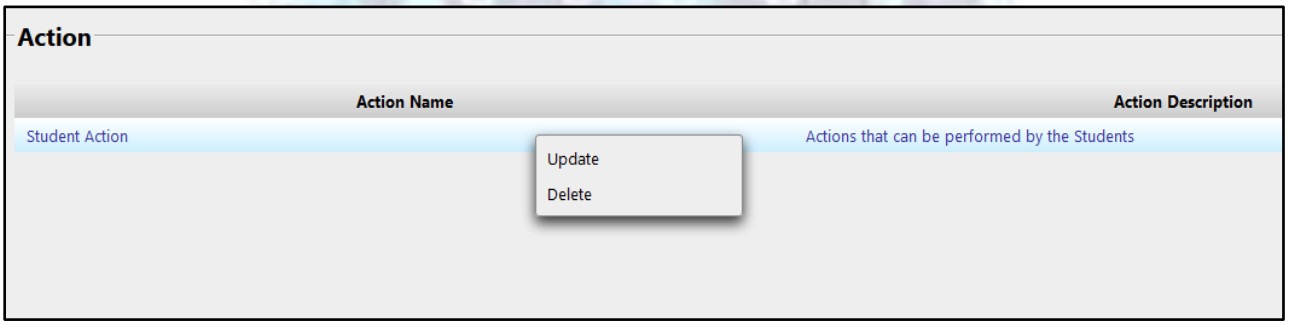
10. Now two different Action Attributes are visible under the **Action Attribute** tab as shown in figure below.

11. In order to view the values for specific Attributes, click on the required Attribute. It enables the "+" button as shown below. By clicking on "+" button more Attribute values can be added to the selected Attribute.

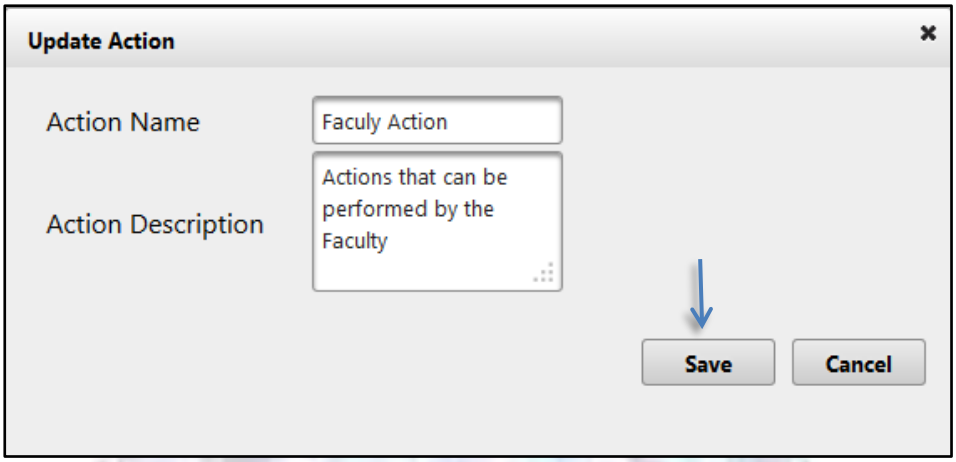


MA- 2: Update Action

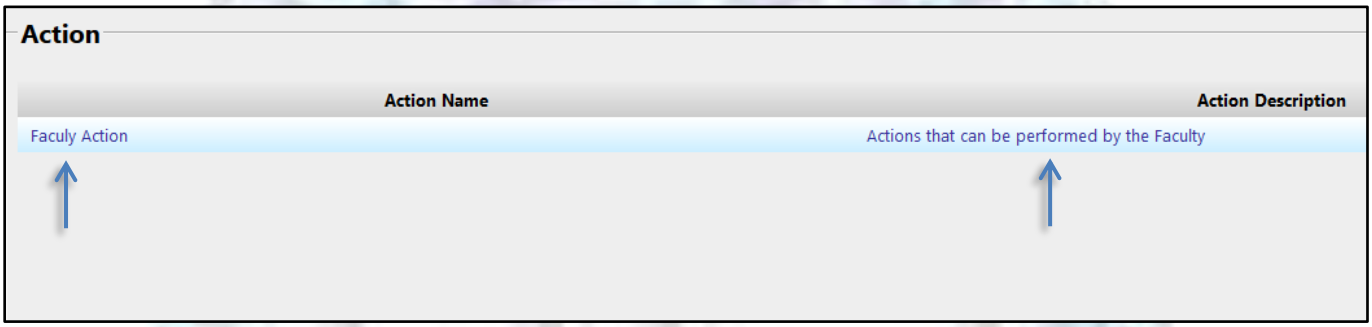
1. To update an added Action, right click on that specific Action in main **Action** interface and then select the **Update** option form the menu as depicted in below figure.



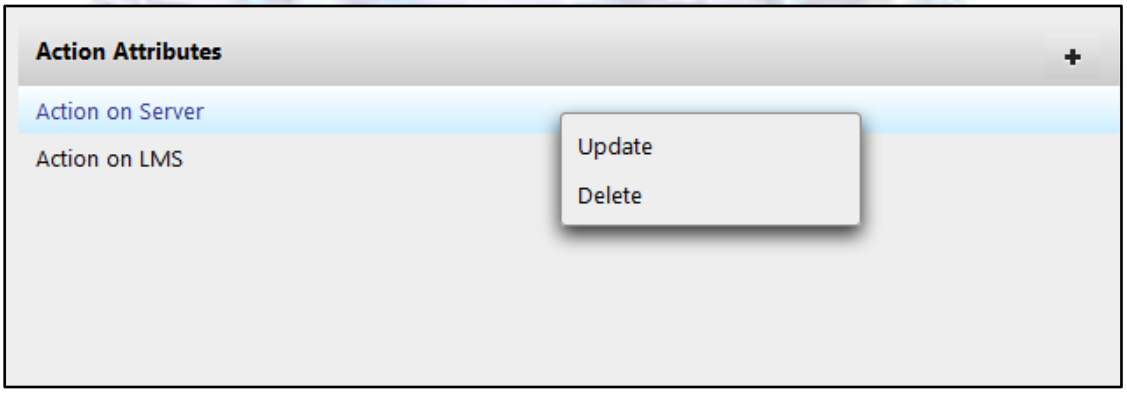
2. The following interface appears after selecting the **Update** option in previous step. You can update any of the two values which include **Action Name** or **Action Description**. After updating the required fields, click on the **Save** button.



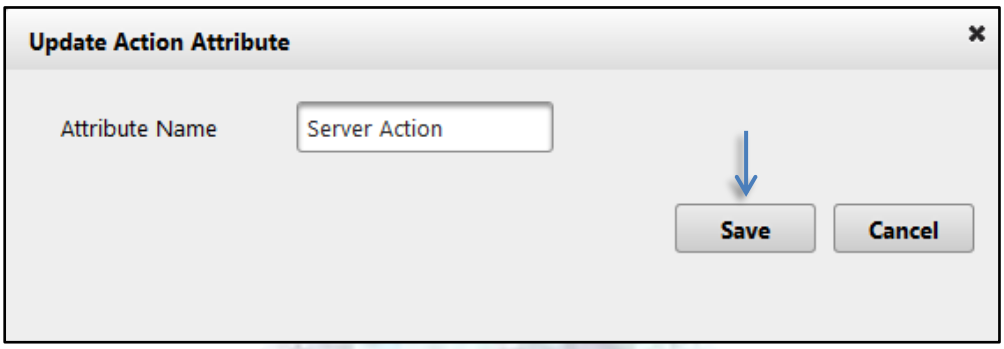
3. The updated results are visible on the main **Action** interface as shown below.



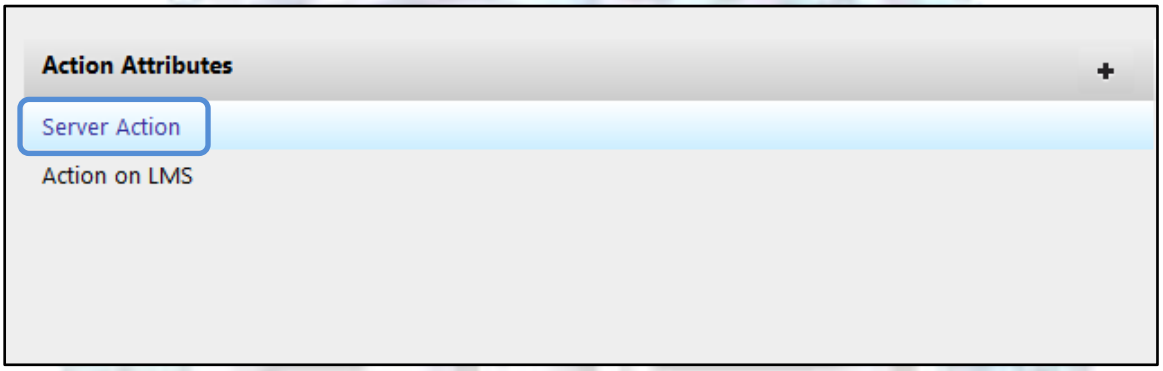
4. Similarly, any Attribute of the Action can also be updated. Right click on the required Attribute under the **Action Attribute** tab of the main **Action** interface. Select the Update option from the menu.



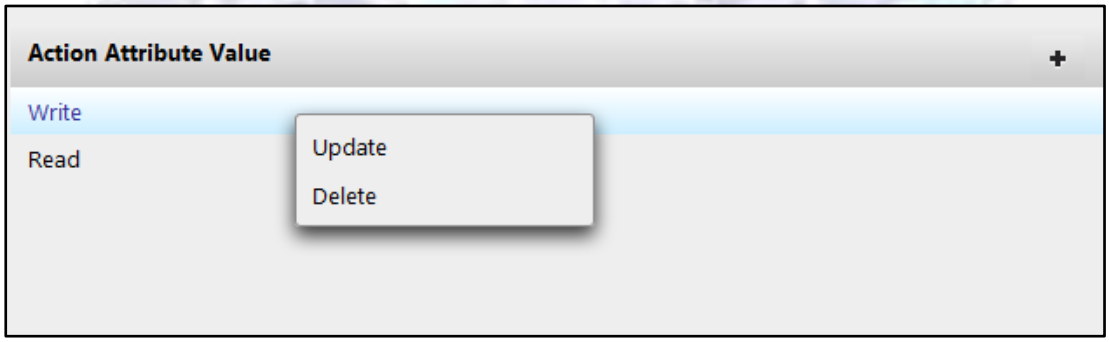
5. **Update Action Attribute** interface is displayed on the screen. Enter the required name in the **Attribute Name** text box and click on **Save** button.



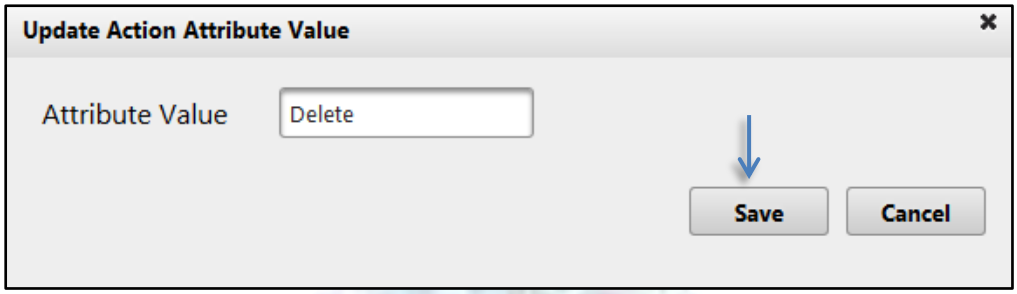
6. The updated results for the particular Attribute appears under the **Action Attribute** tab on main **Action** interface.



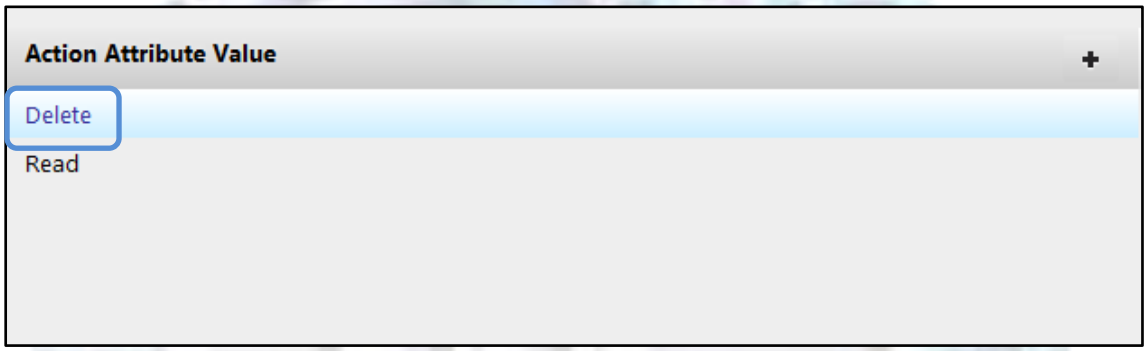
7. Similarly, the values for Attribute can also be updated. Right click on the name of the Attribute Value under **Action Attribute Value** tab. Now select the **Update** option from the menu.



8. The following window is displayed. Enter the new required value for Attribute and then click on **Save** button.

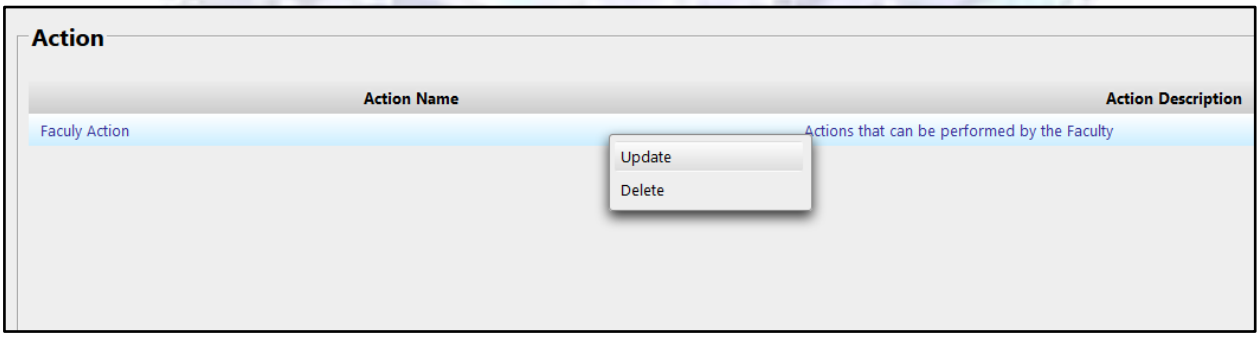


9. The updated value for the Action attribute is displayed instead of the previous value as shown below.

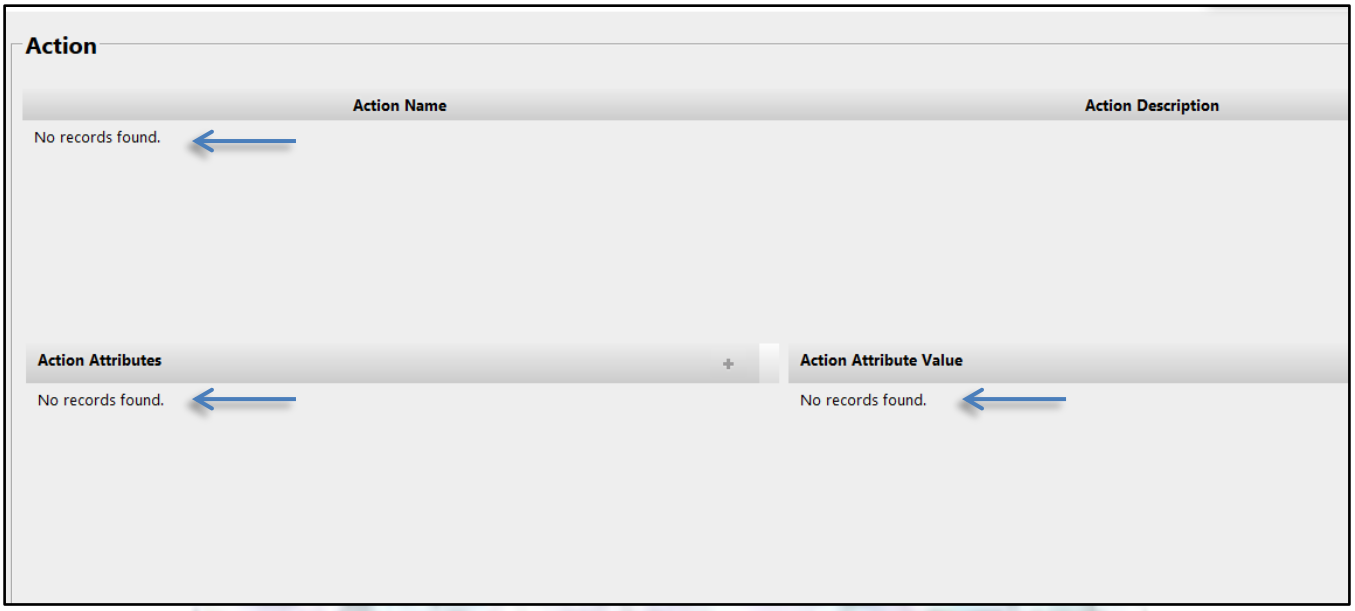


MA- 3: Delete Action

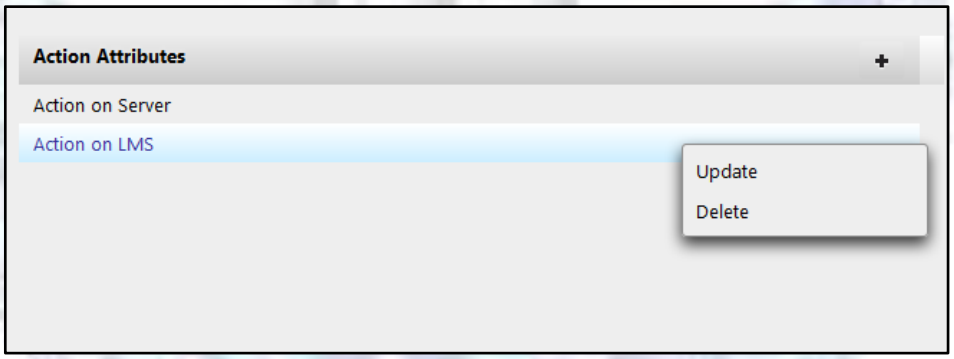
1. To delete a particular Action, click on the name of that Action in main **Action** interface. Select the **Delete** option from the dropdown list.



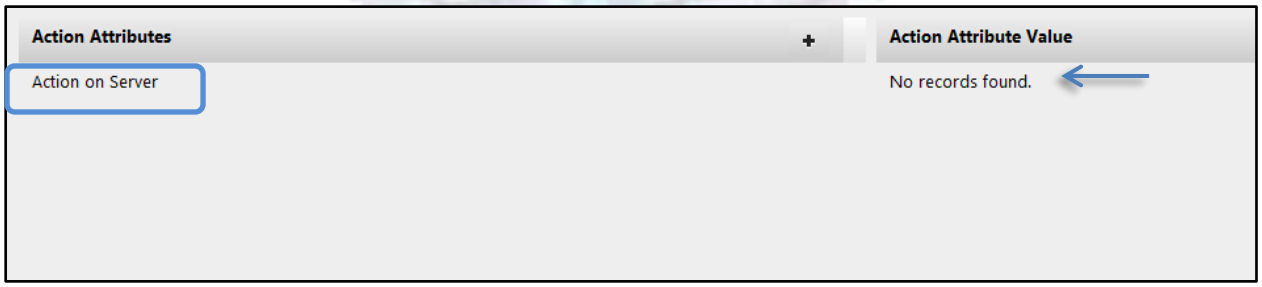
2. The selected Action is deleted as shown in below figure. The **Action Attributes** and **Action Attribute Values** is also deleted for that specific Action



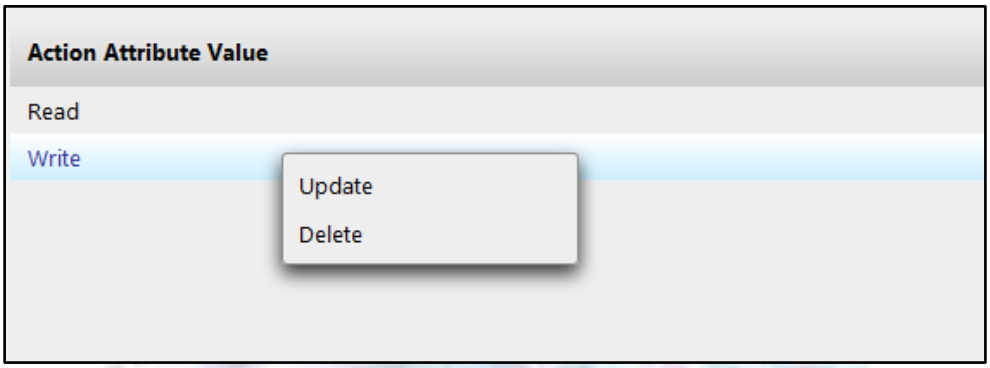
3. In order to delete an Attribute of particular Action, click on that Attribute under **Action Attribute** tab on the main **Action** interface. Click on the **Delete** option from the menu.



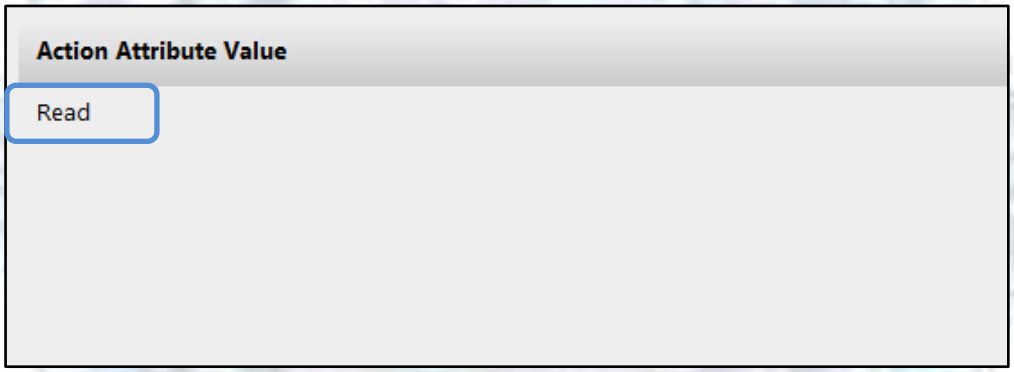
4. The selected Attribute is deleted along with all of its Attribute values as shown in below figure.



5. To delete a particular Attribute value, click on that value under the **Action Attribute Value** tab and click on the **Delete** option.



6. The selected Attribute value is deleted as shown in below figure.

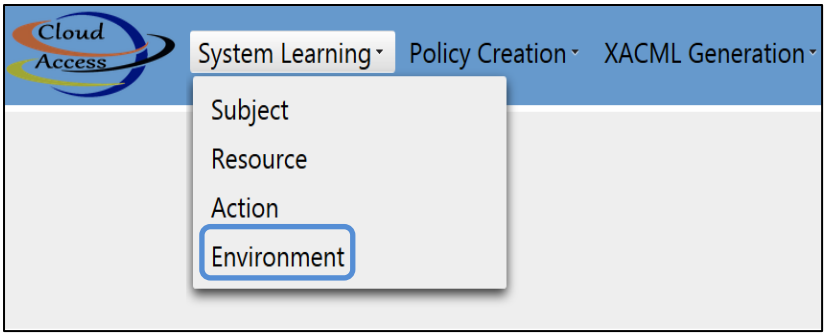


SL- 4: Manage Environment

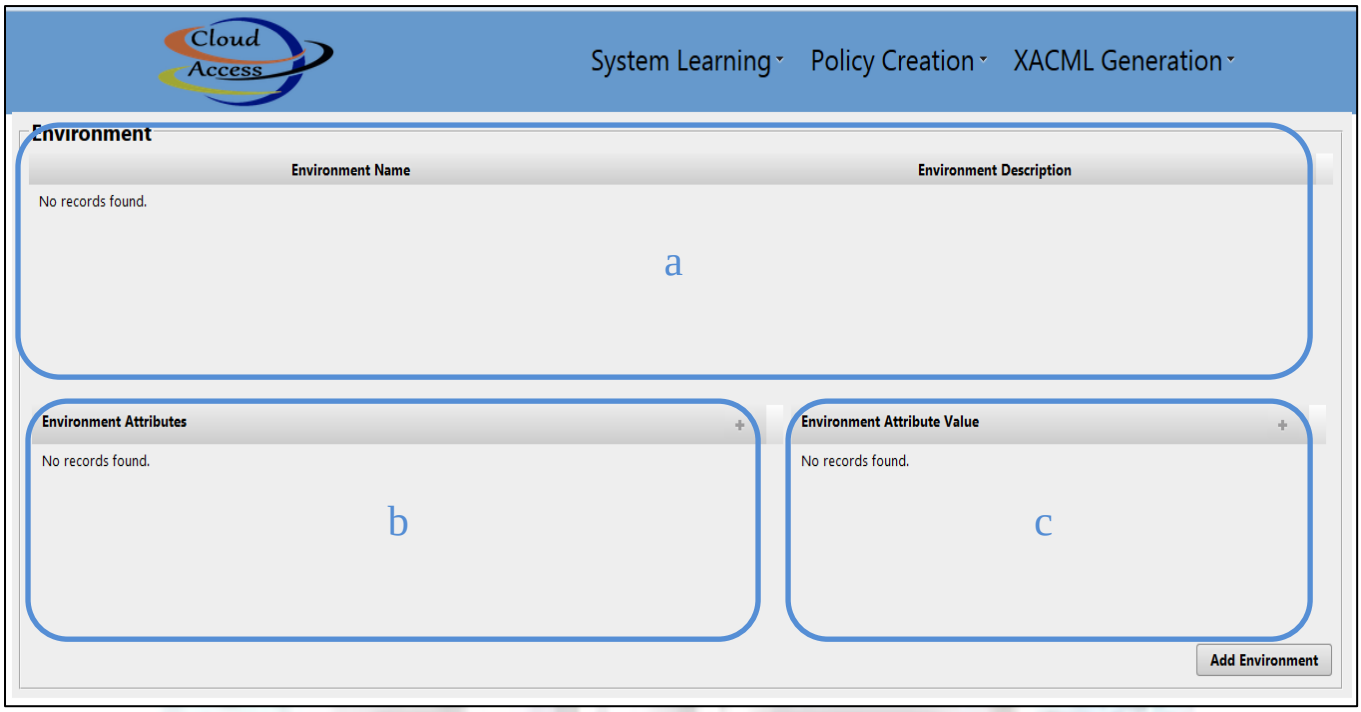
In this section, we demonstrate how to create, update and delete the Environment parameter in 'System Learning' phase.

ME- 1: Create Environment

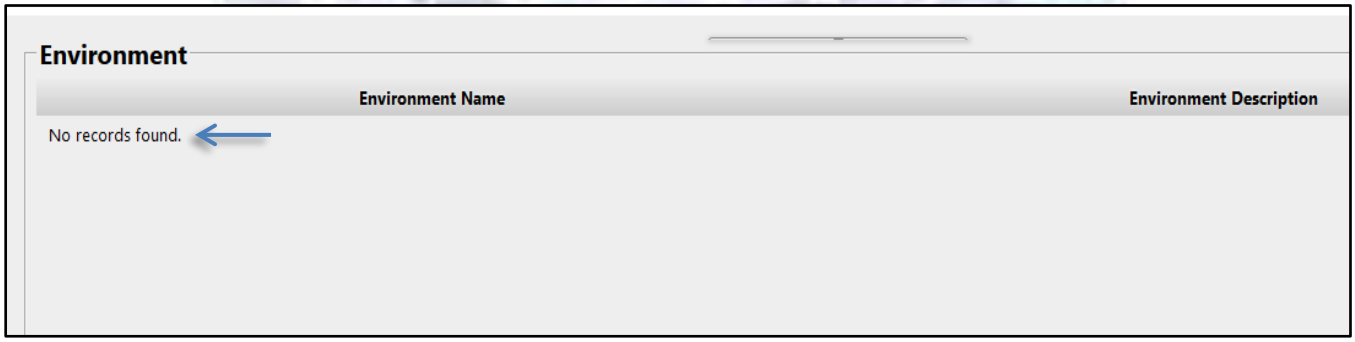
1. In order to create Environment, select the **Environment** option from dropdown list as depicted below.



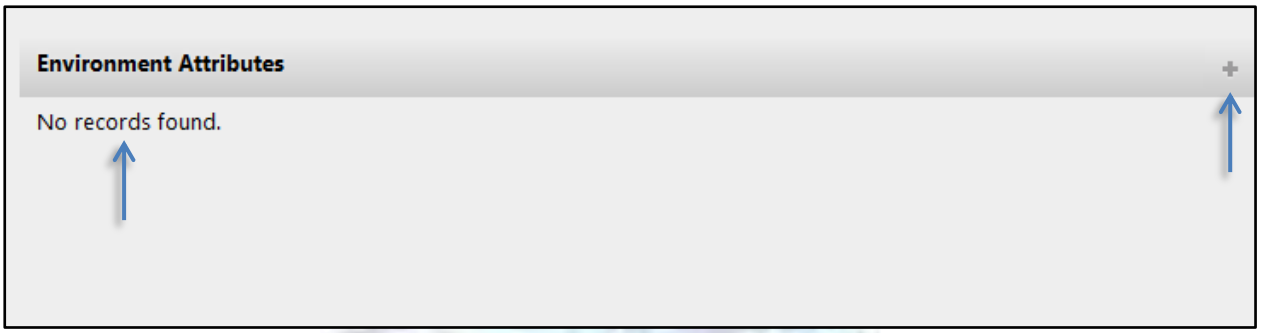
2. After selecting the **Environment** option in previous step, the following **Environment** interface is opened. This interface further includes three main portions as highlighted with "a", "b" and "c" in the below figure.



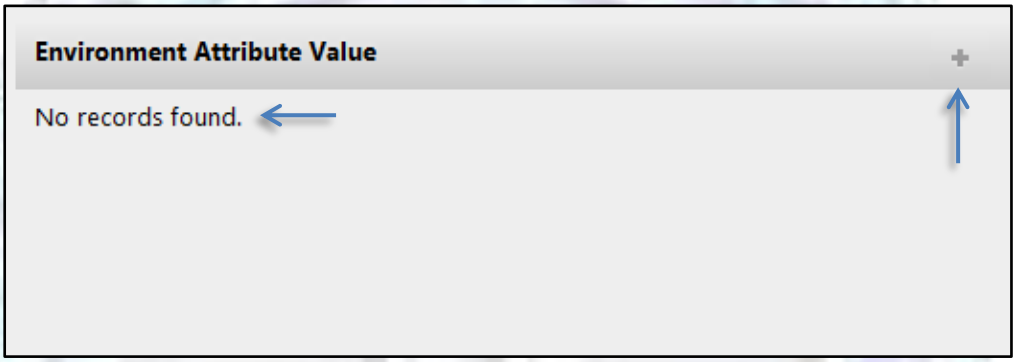
a) The upper portion of the **Environment** interface contains **Environment Name** and **Environment Description** tabs. Initially, when no Environment is added in the database, "*No records found"* is displayed.



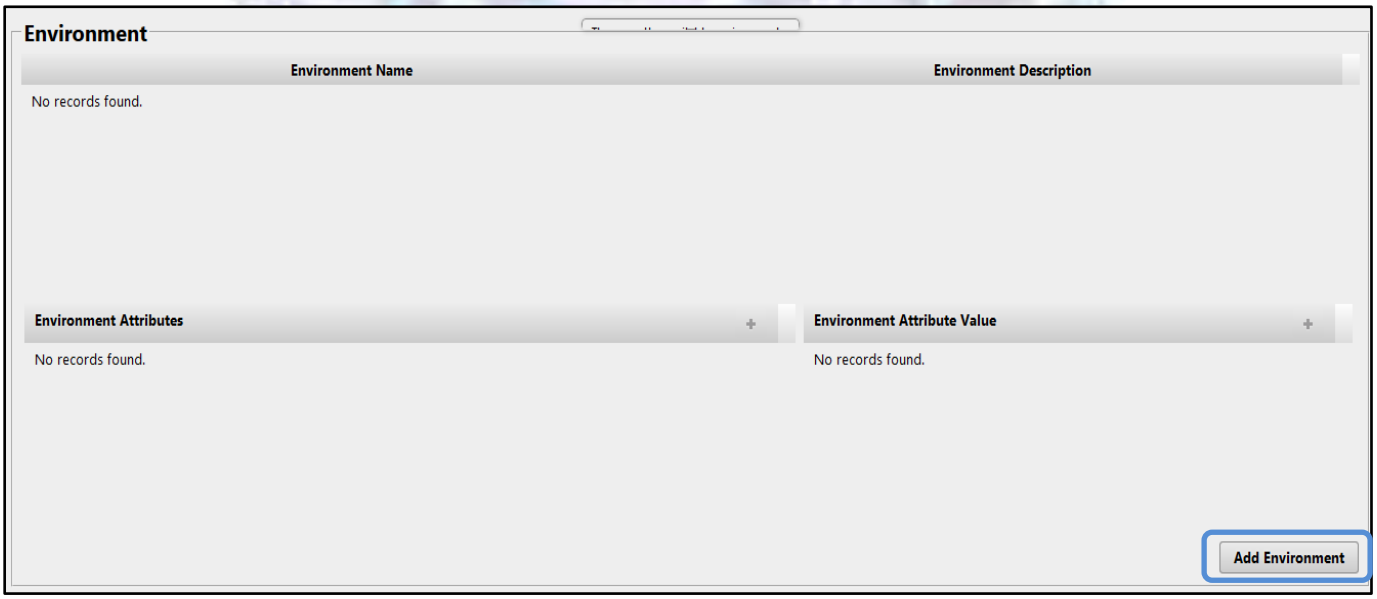
b) The second portion of this interface contains the **Environment Attributes** tab that enlists the added Attributes for a given Environment. Initially, when there are no records in the database, the "+" button is disabled.



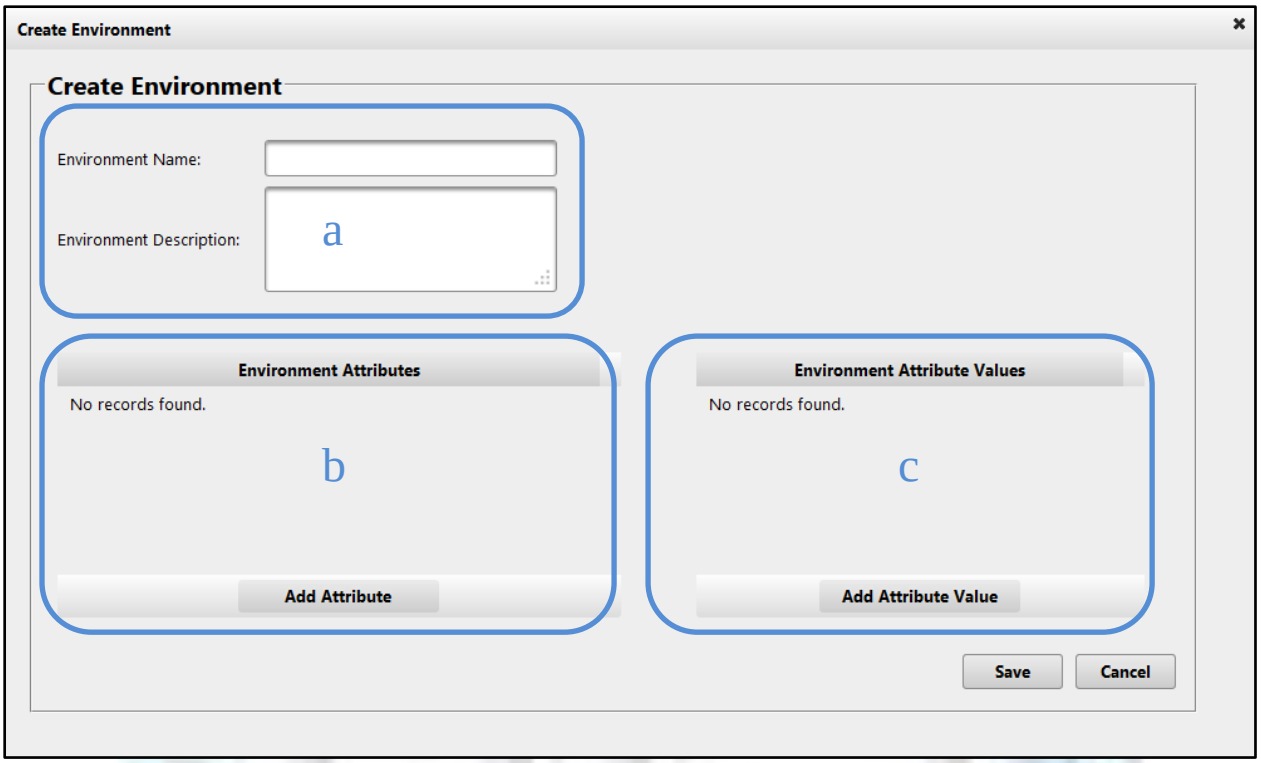
c) The third portion of the interface consists of **Environment Attribute Values** tab that gives a list of different values for a specific Attribute. At the start, when no Environment, Attribute and Attribute values are added, the "+" sign is disabled.



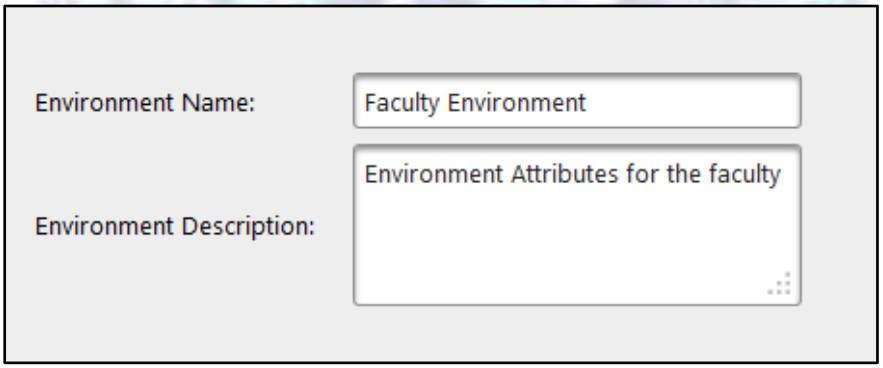
3. Click on the **Add Environment** button on the bottom right corner of the below interface.



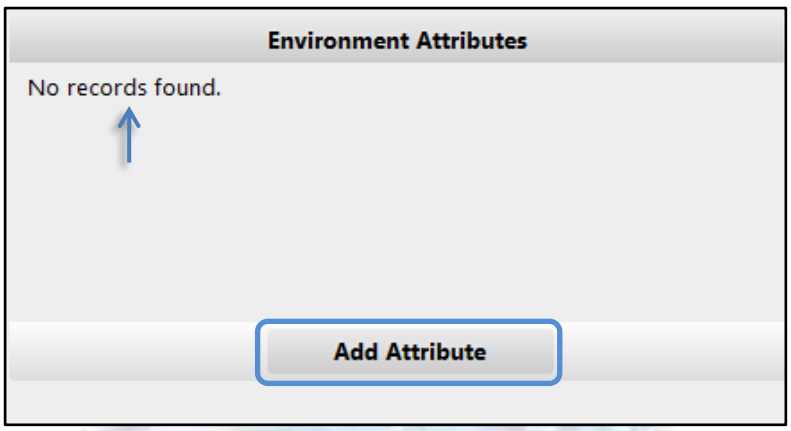
4. The **Create Environment** interface is opened to add the required number of Environments. This interface further has three main portions to add the Environment , its Attributes and Attribute values, as highlighted with “a”, “b” and “c” in figure below.



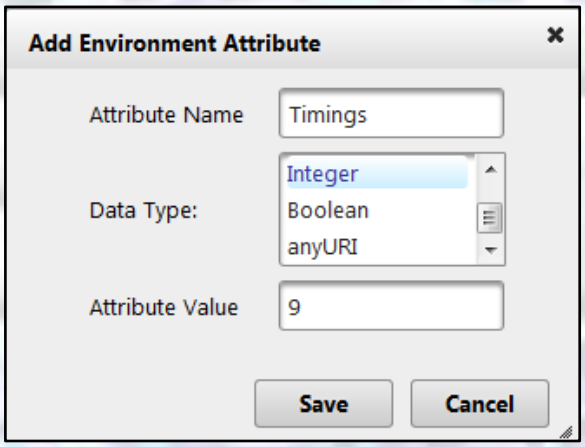
a-1) The first portion of the interface consists of **Environment Name** and **Environment Description** text boxes. In order to create an Environment, add the required name and description in text boxes as shown below.



b-1) The second part of the **Create Environment** interface provides the **Add Attribute** button to add the required Attributes to the added Environment in previous step.



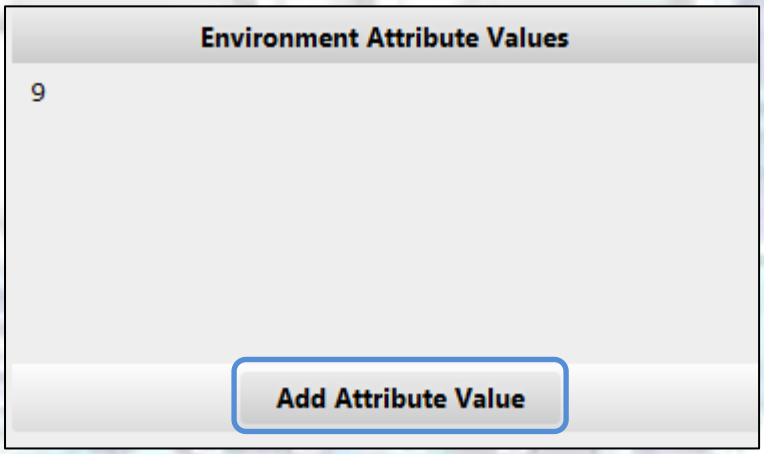
b-2) The following interface is opened to add the required Environment Attributes. It consists of **Attribute Name**, **Data Type** and **Attribute Value** text boxes. Enter the required Attribute name, its value and select the data type from the given list. Finally click on the **Save** button as shown below.



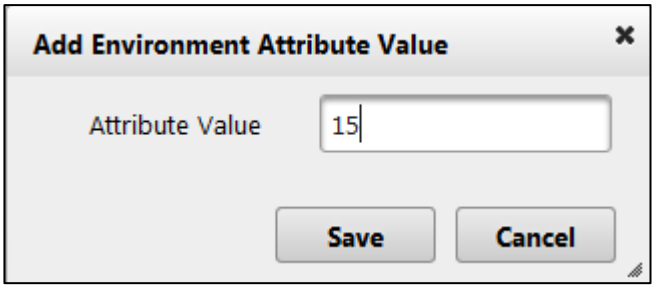
b-3) The added Attribute is displayed under the **Environment Attribute** tab as shown in below figure.

c- 1) The third portion of the **Create Environment** interface consists of the **Add Attribute Value** button to add more than one value for specific Attribute. It is compulsory to select the required Attribute from the **Environment Attributes** before adding the values. If the **Add Attribute Value** button is clicked without selecting any Attribute, a warning message is popped out to first select the desired Attribute.

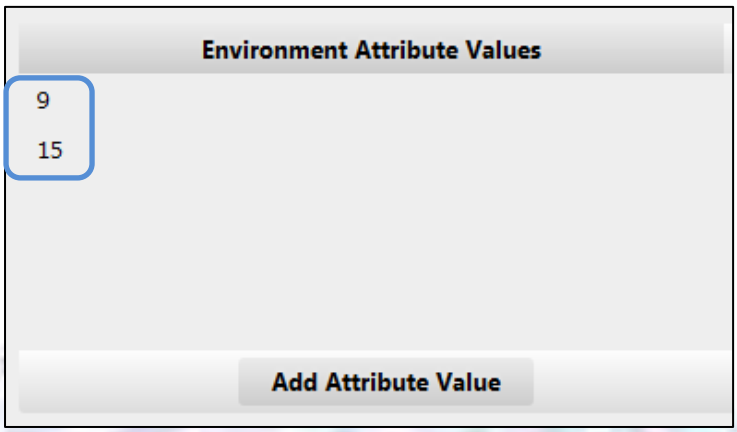
c- 2) After selecting the required Environment Attribute, now click on the **Add Attribute Value** button to add a new value for the selected Attribute of Environment.



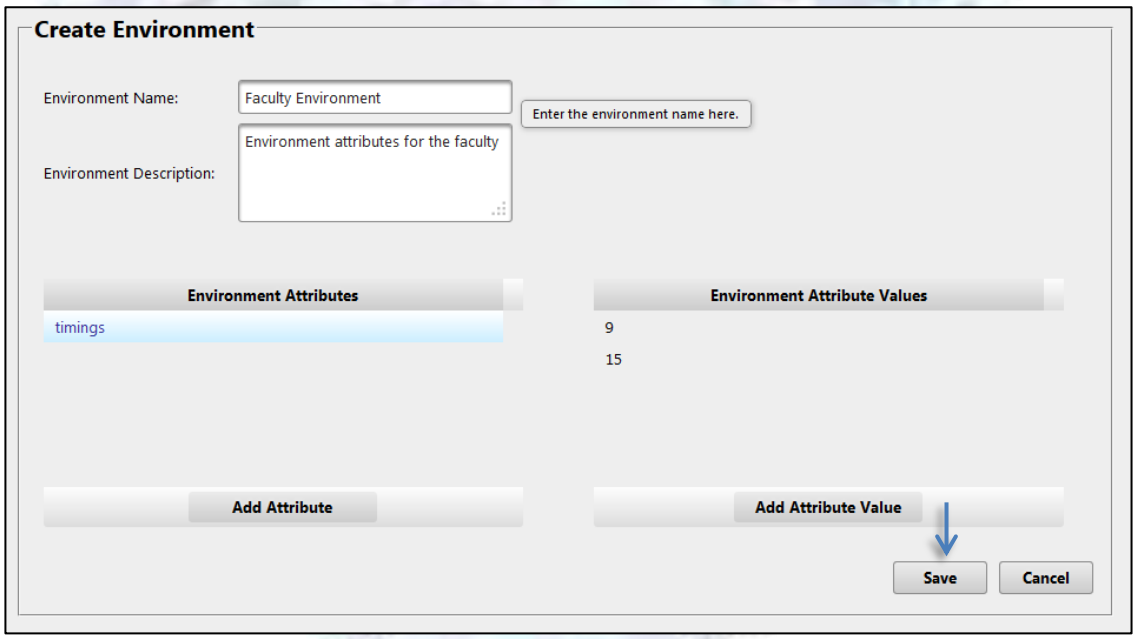
c- 3) The following window appears on the screen containing the **Attribute Value** text box. Enter the required value for Attribute and then click on **Save** button as shown in below figure.



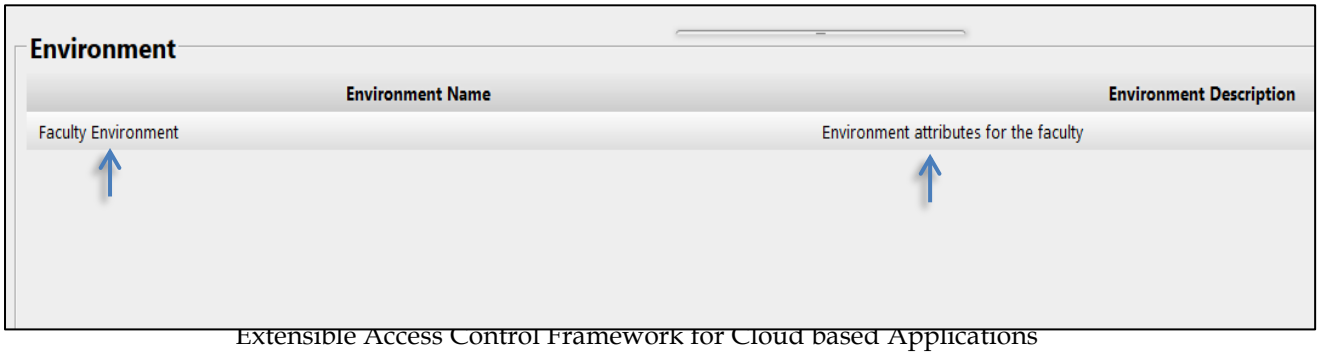
c- 4) After saving the Attribute Value, the following two values are visible under the **Environment Attribute Values** tab as shown in below figure.



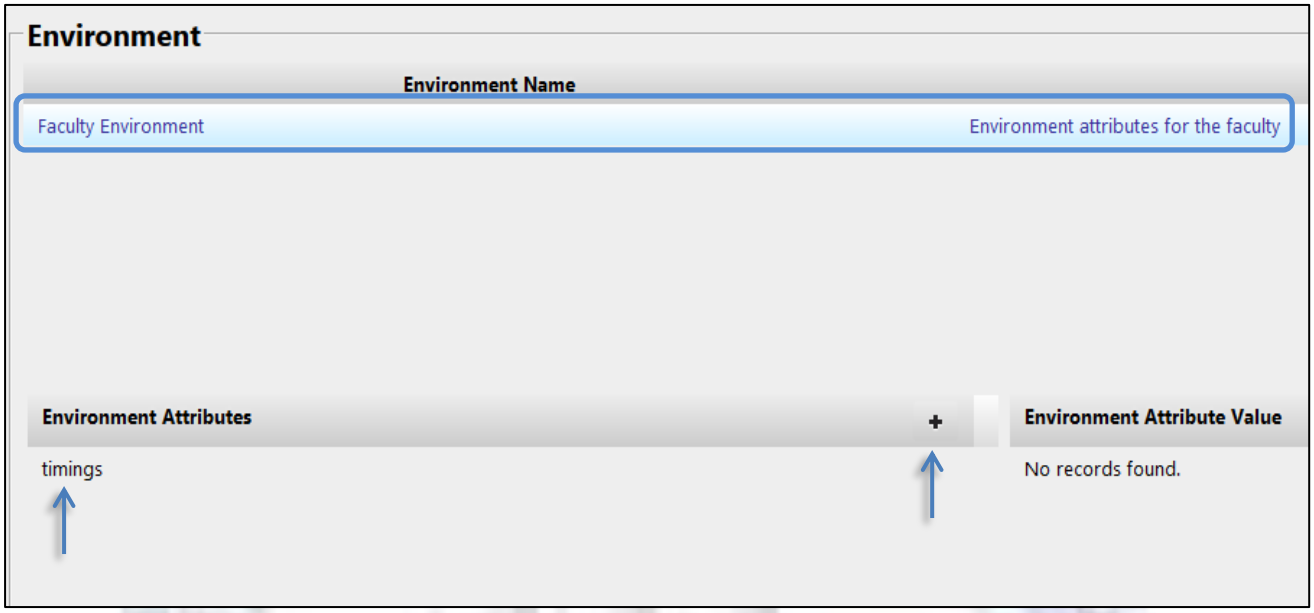
5. Now click on the **Save** button in the **Create Environment** interface to save the added Environment in database as shown below.



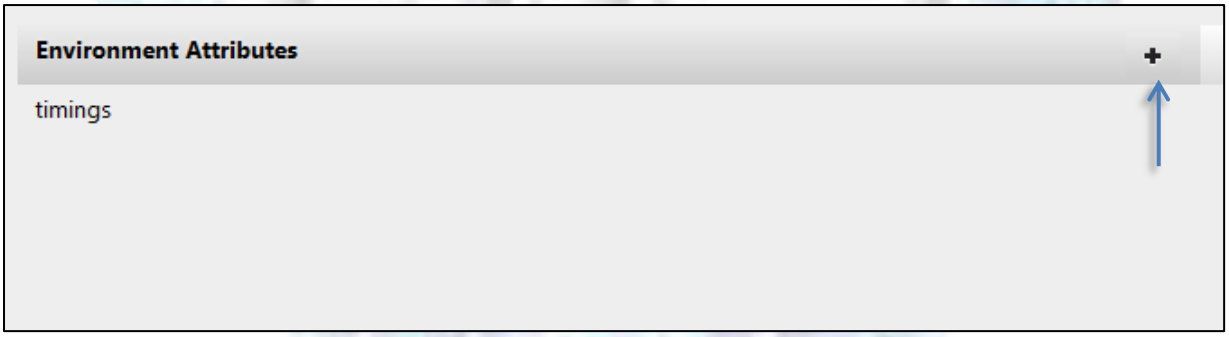
6. The added Action is displayed on **Environment** interface with its values under the **Environment Name** and **Environment Description** tabs as shown in below figure.



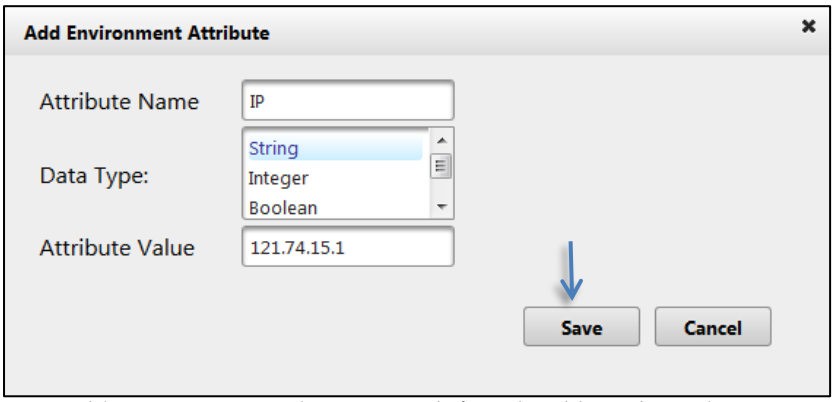
7. Now click on the newly added line of Environment, it displays the Attributes of that Environment under the **Environment Attribute** tab as well as the "+" sign is also enabled to add more Attributes for the selected Environment.



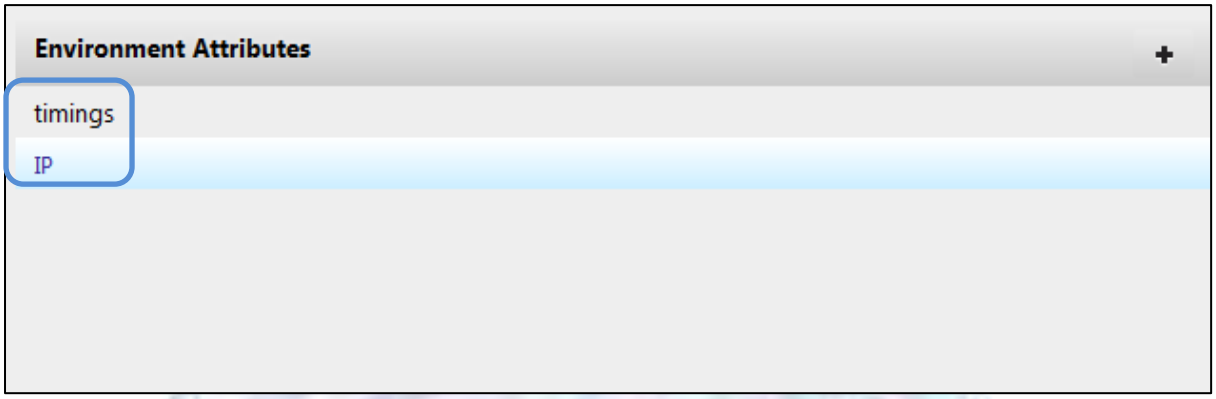
8. In order to add more Environment Attributes, click on the "+" button as shown below.



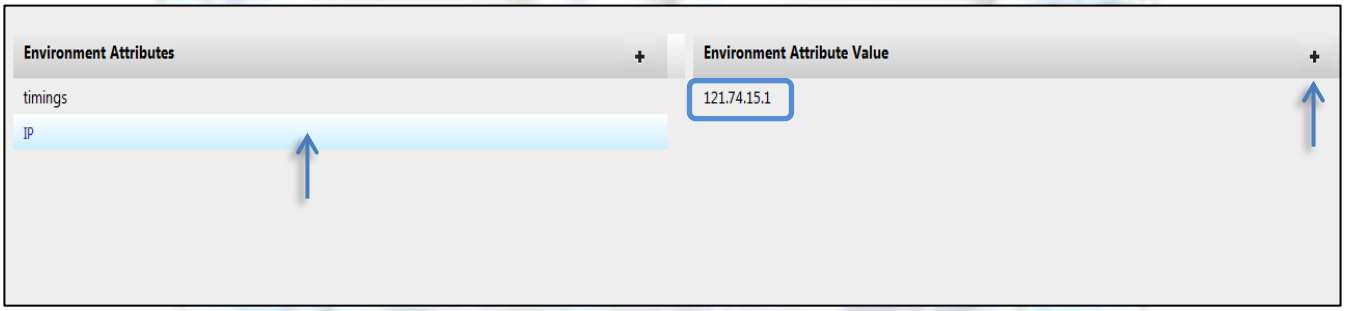
9. Add the required values for **Attribute Name**, **Data Type** and **Attribute Value** and then click on **Save** button.



10. Now two different Environment Attributes are visible under the **Environment Attribute** tab as shown in figure below.

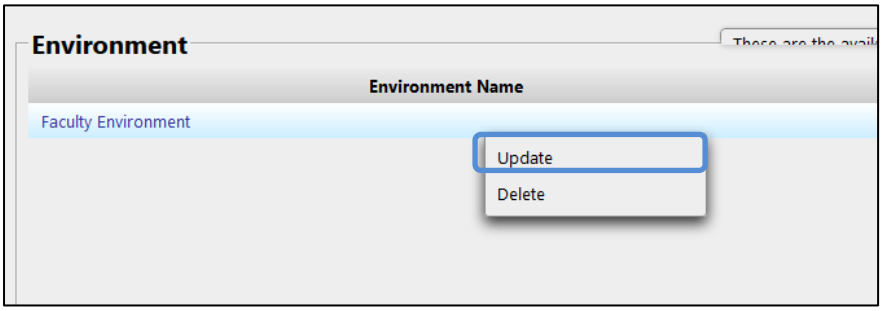


11. In order to view the values for specific Attributes, click on the required Attribute. It also enables the "+" button as shown below. By clicking on "+" button more Attribute values can be added to the selected Attribute.

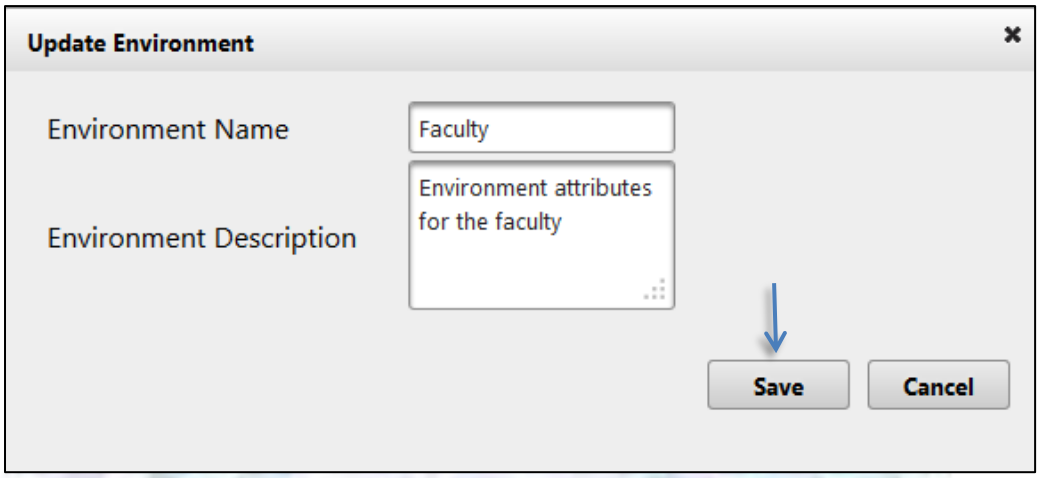


ME- 2: Update Environment

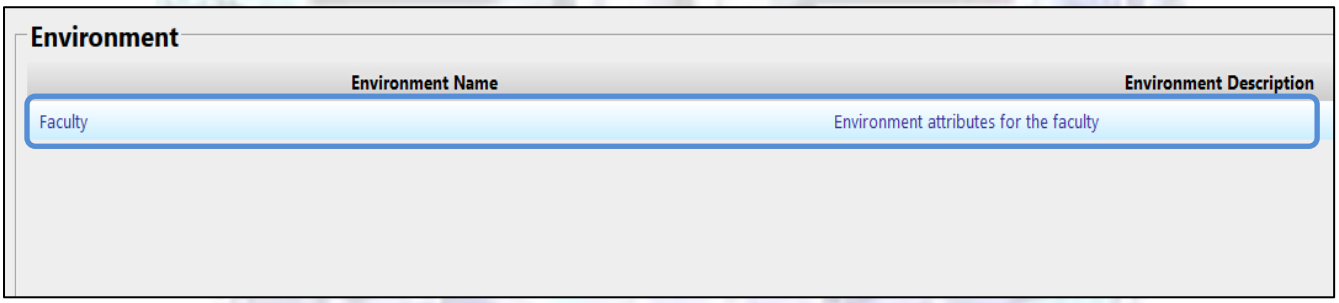
1. To update an added Environment, right click on that specific Environment in main **Environment** interface and then select the **Update** option form the menu as depicted in below figure.



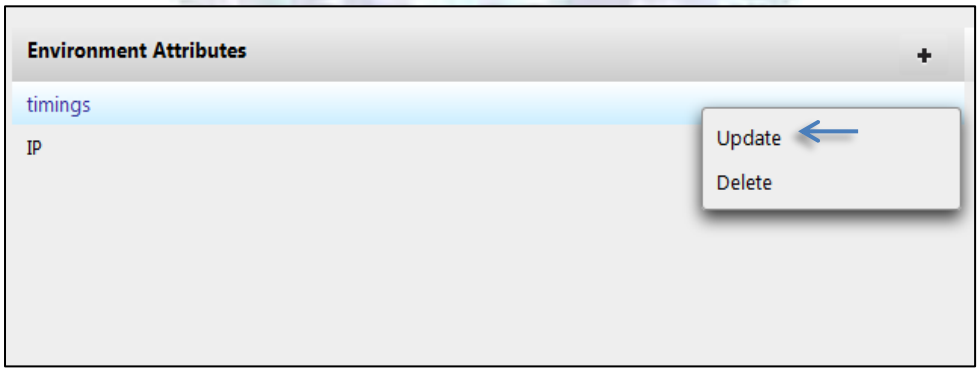
2. The following interface appears after selecting the **Update** option in previous step. You can update any of the two values which include **Environment Name** or **Environment Description**. After updating the required fields, click on the **Save** button.



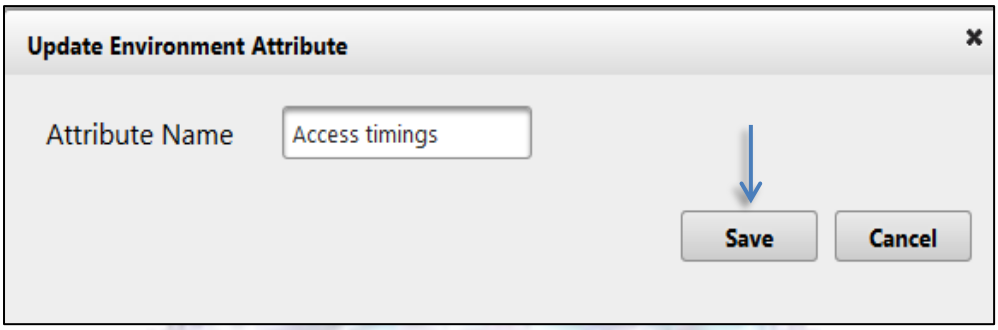
3. The updated results are also visible on the main **Environment** interface as shown below.



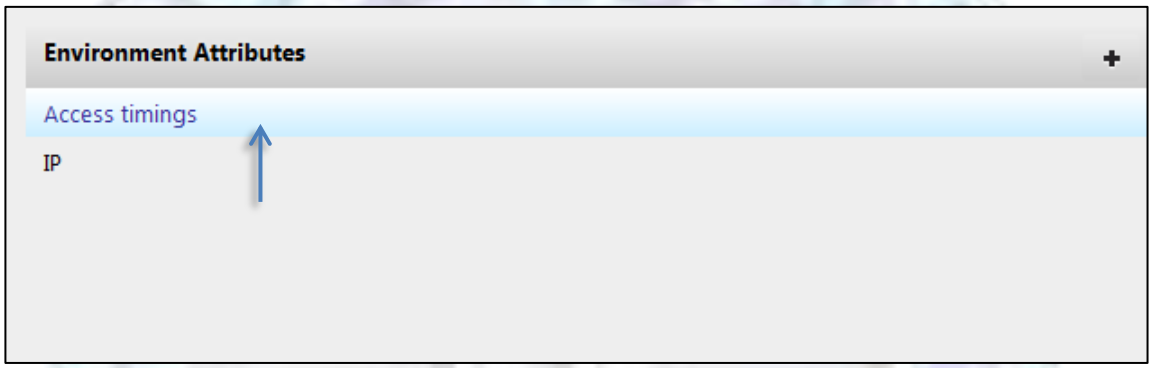
4. Similarly, any Attribute of the Environment can also be updated. Click on the required Attribute under the **Environment Attribute** tab of the main **Environment** interface. A dropdown menu appears on screen. Select the Update option.



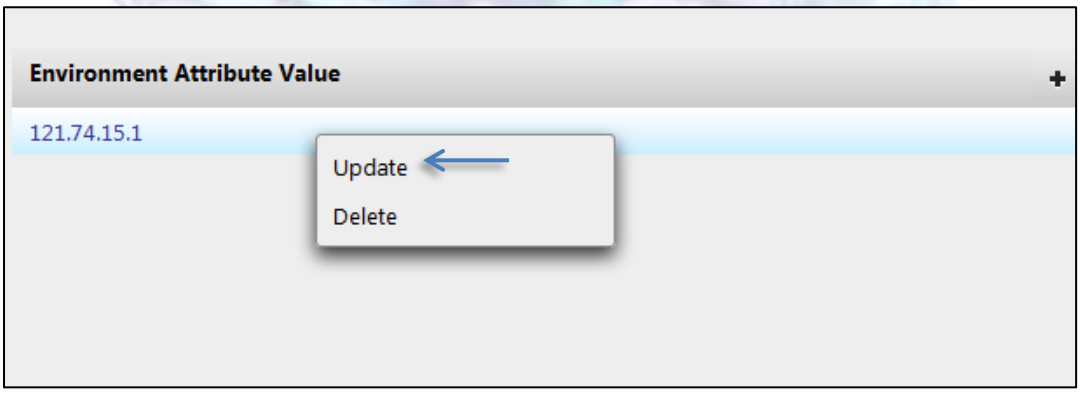
5. **Update Environment Attribute** interface is displayed on the screen. Enter the required name in the **Attribute Name** text box and click on **save** button.



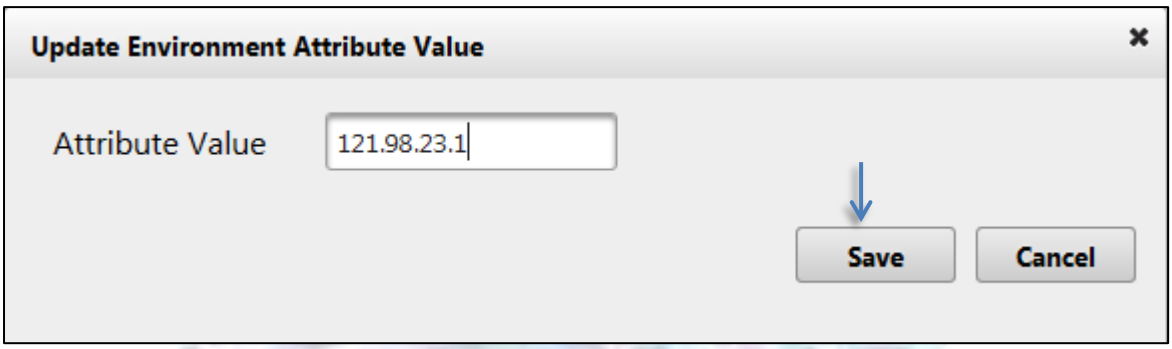
6. The updated results for the particular Attribute appears under the **Environment Attribute** tab on main **Environment** interface.



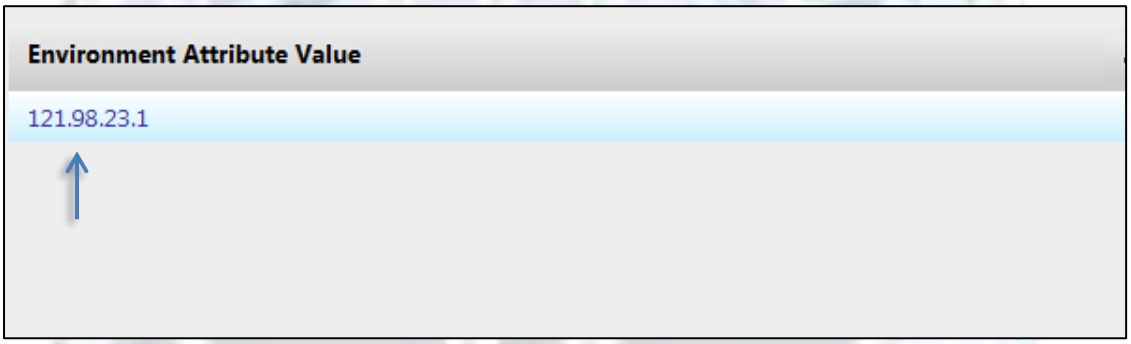
7. Similarly, the values for Attribute can also be updated. Right click on the name of the Attribute Value under **Environment Attribute Value** tab. Now select the **Update** option from the dropdown list.



8. The following window appears on screen. Enter the new required value for Attribute and then click on **Save** button.

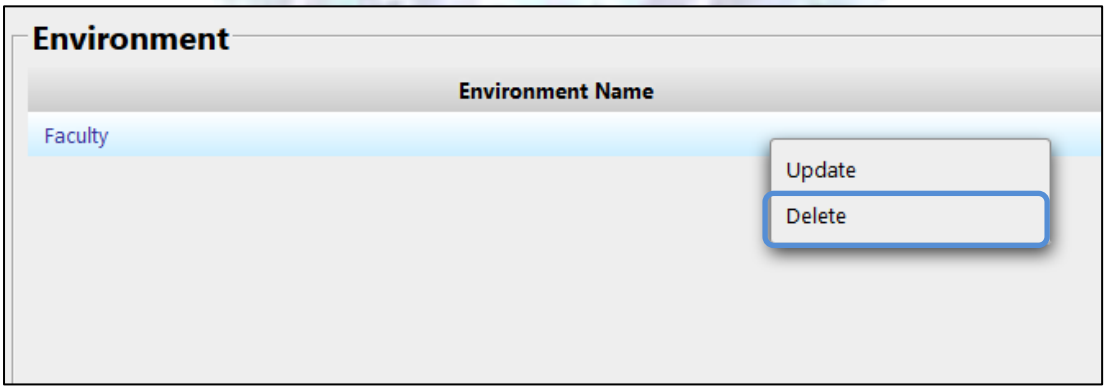


9. The updated value for the Environment Attribute is displayed instead of the previous value as shown below.

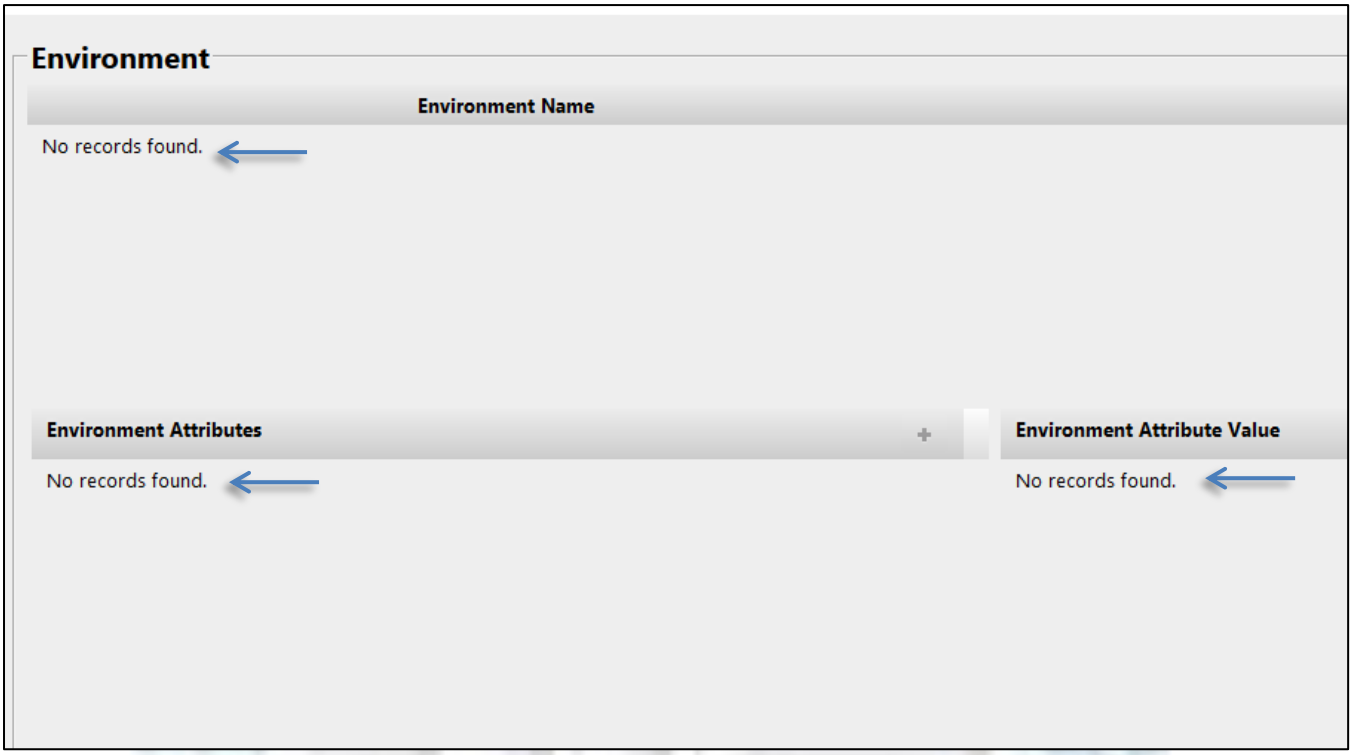


ME- 3: Delete Environment

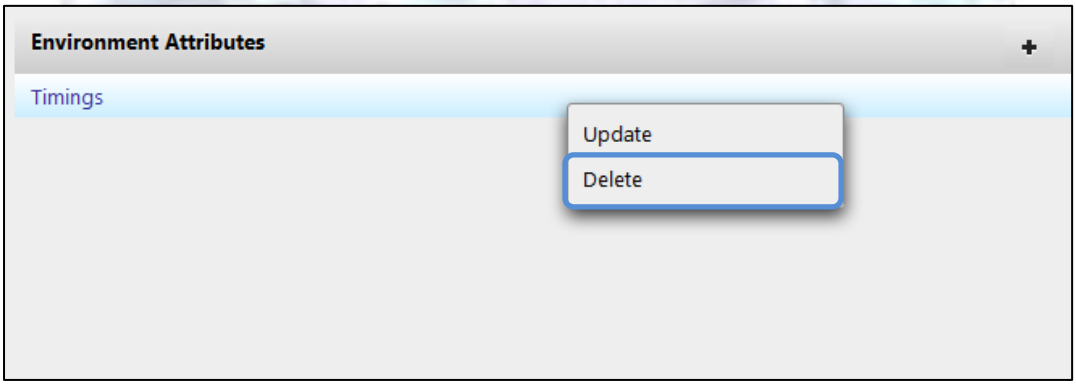
1. Right click on the name of that Environment in main **Environment** interface. Select the **Delete** option from the dropdown list.



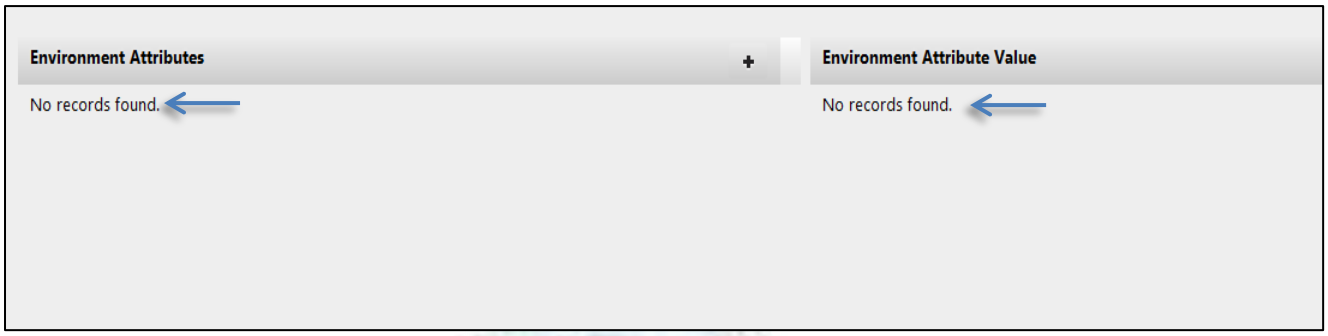
2. The selected Environment is deleted as shown in below figure. The **Environment Attributes** and **Environment Attribute Values** are also deleted for that specific Environment.



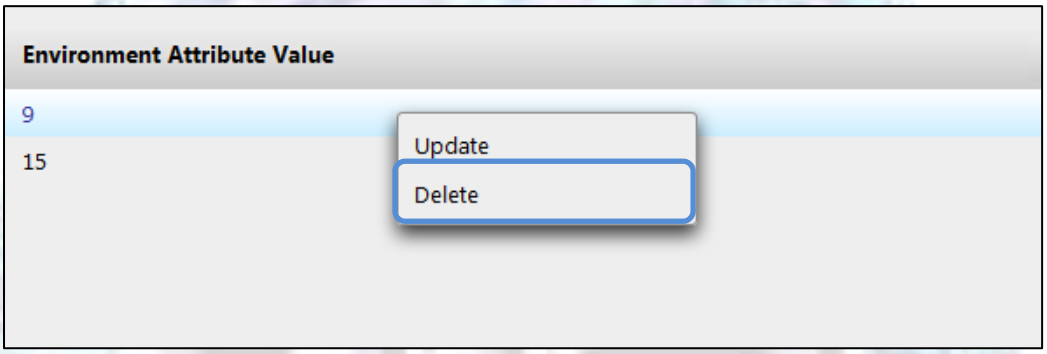
3. In order to delete an attribute of particular Environment, click on that attribute under **Environment Attribute** tab on the main **Environment** interface. Click on the **Delete** option from the dropdown list.



4. The selected Attribute is deleted along with all of its Attribute Values as shown in below figure.



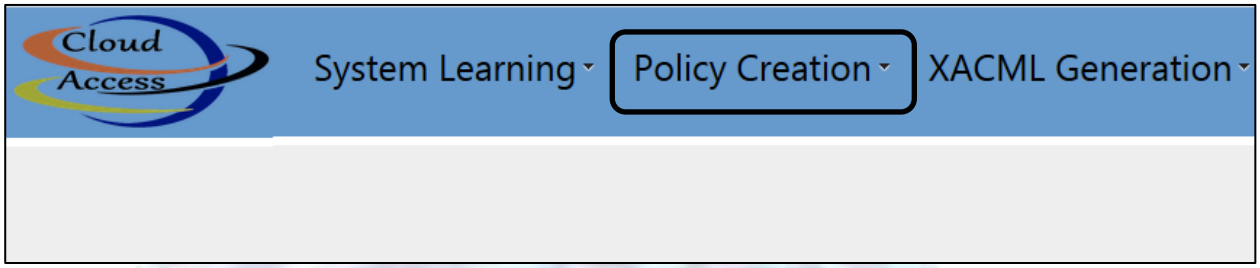
5. To delete a particular Attribute Value, click on that value under the **Environment Attribute Value** tab and click on the **Delete** option.



B. Policy Creation:

In this section, we demonstrate the procedure to perform add, update and delete operations on the Target, Rule, Policy and Policy Set parameters in the 'Policy Creation' phase.

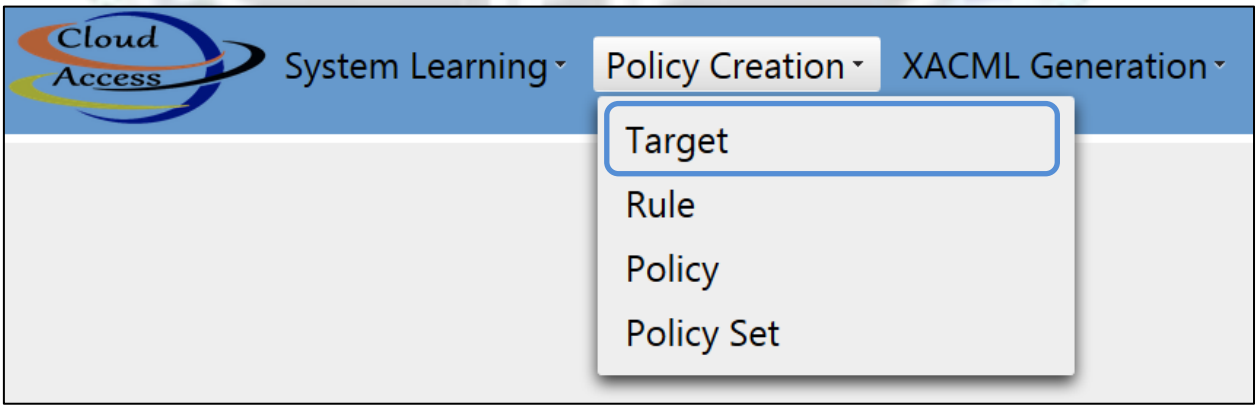
Select **Policy Creation** option form the main interface of policy administration point



Click on 'Policy Creation' will display its associated options that are Target, Rule, Policy and Policy Set. Accordingly, the four main subsections include **Manage Target**, **Manage Rule**, **Manage Policy** and **Manage Policy Set**.

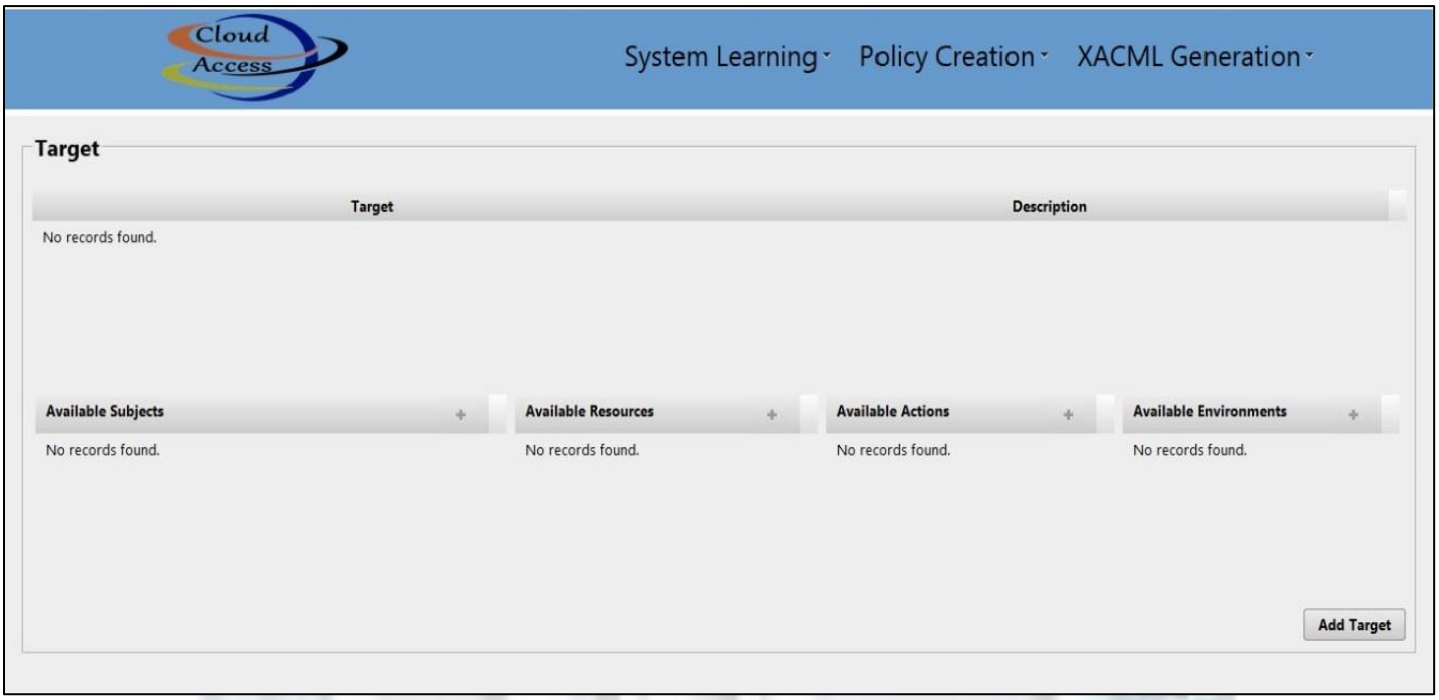
PC - 1. Manage Target:

Select **Target** option from the main **Policy Creation** dropdown-menu to add, update and delete Targets and its related parameters including Subject, Action, Resource and Environment.

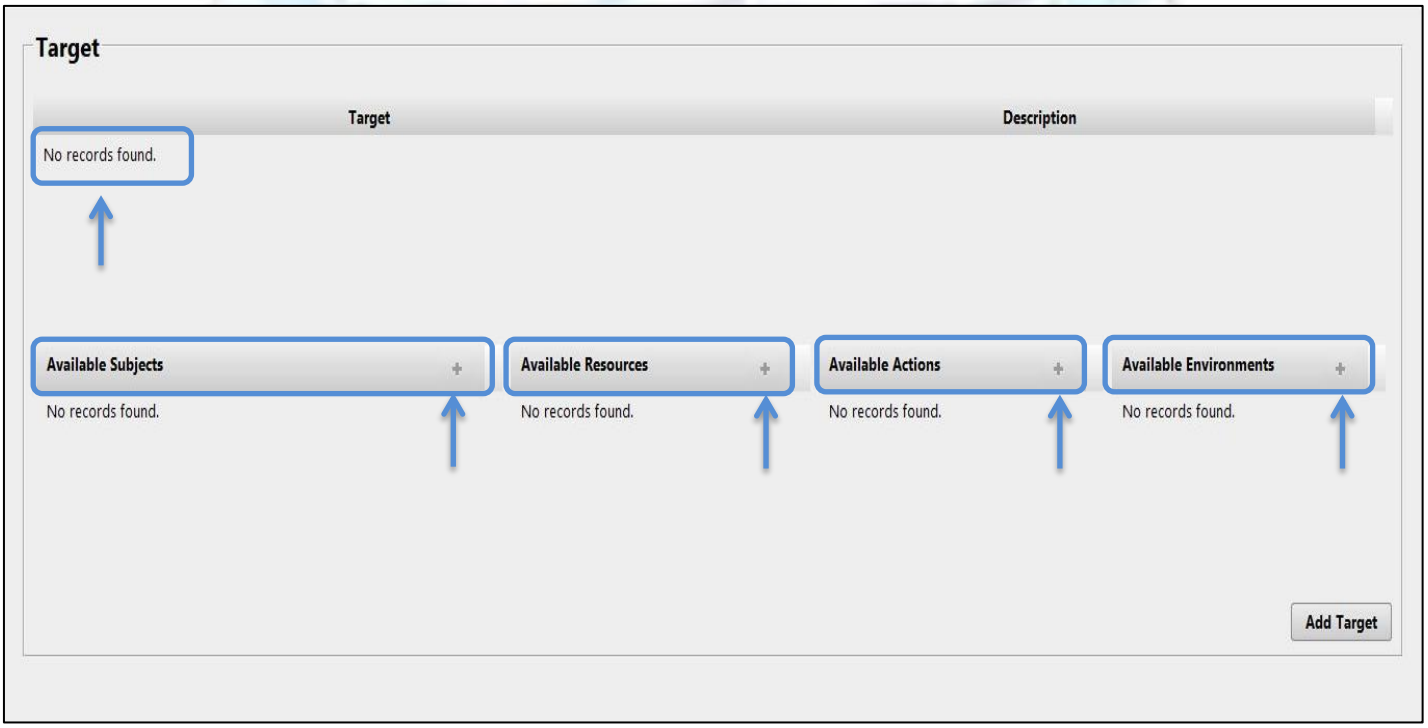


MT - 1: Create Target

1. Below is the main **Targe**t interface, which is used to add, update and delete Target parameters. It also provides the provision to associate existing Subject, Resource, Action and Environment parameters with the new or existing Target parameters.

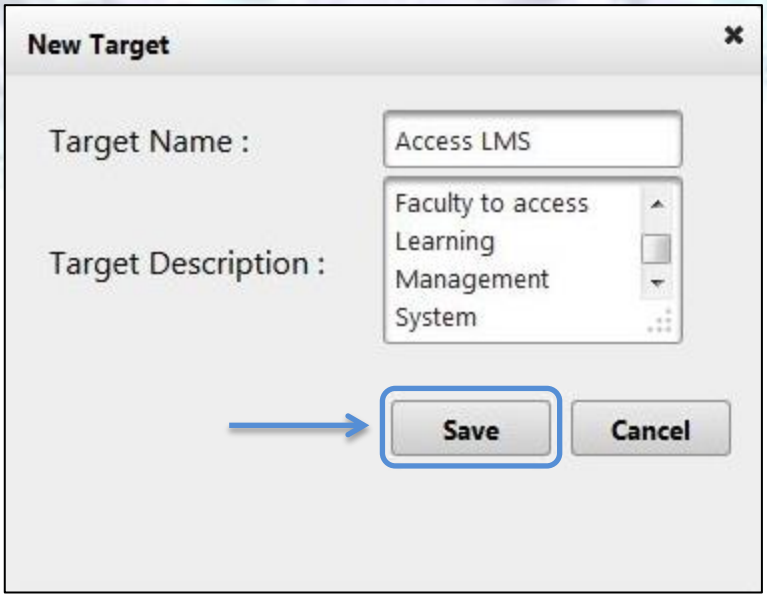


2. Initially, when **No Records Found** for Target parameter then add ("+") option for **Available Subjects**, **Available Resources**, **Available Actions** and **Available Environments** is disabled.

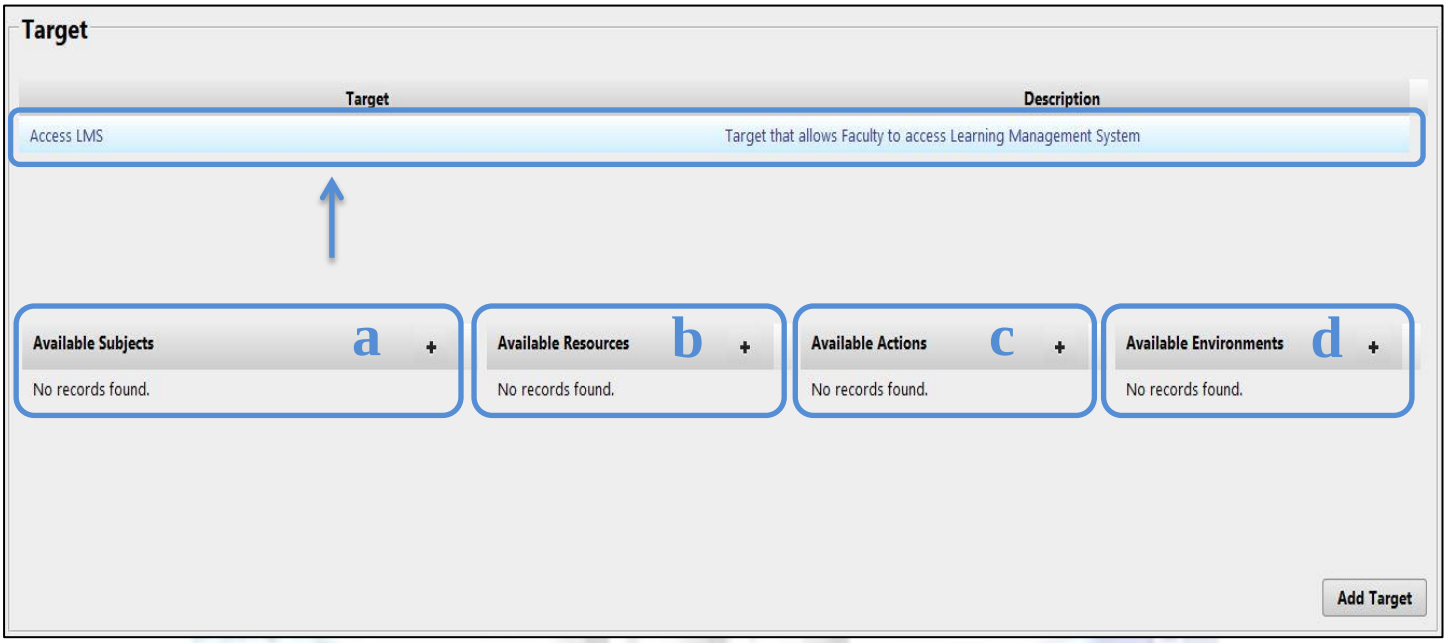


3. Click on **Add Target** button, to add new Target parameter into the database.

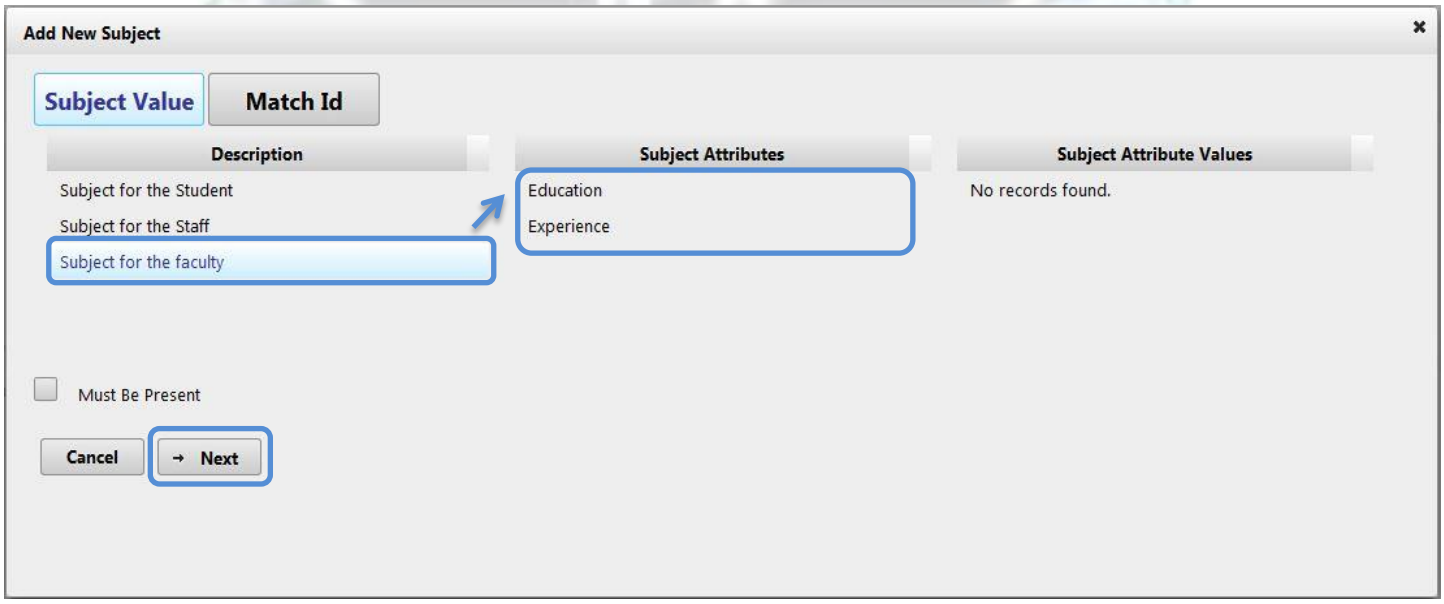
4. In the **New Target** interface, specify Target name, add its description and click **Save** to insert the new Target parameter into the database and **Cancel** to discard the added information.



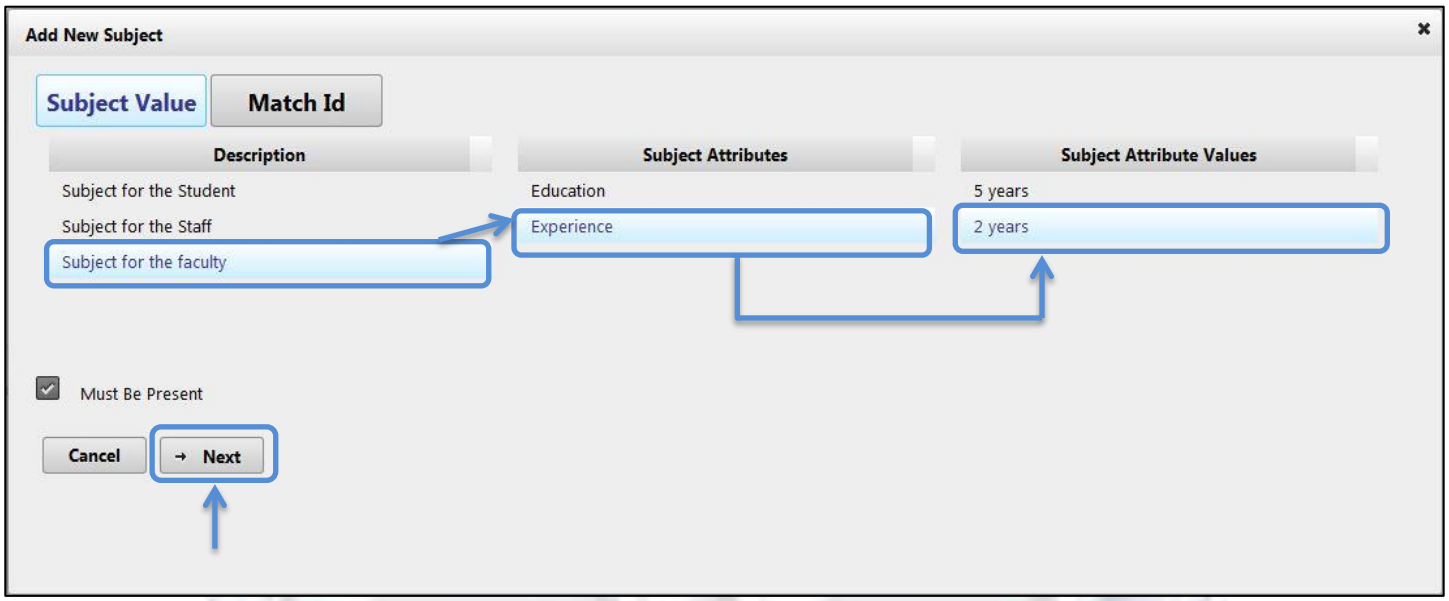
5. Upon successful creation of Target, its name and description appears in the main **Target** interface. Selecting any Target from the available list enables the add/update "+" option for **Available Subjects**, **Available Resources**, **Available Actions** and **Available Environments**.



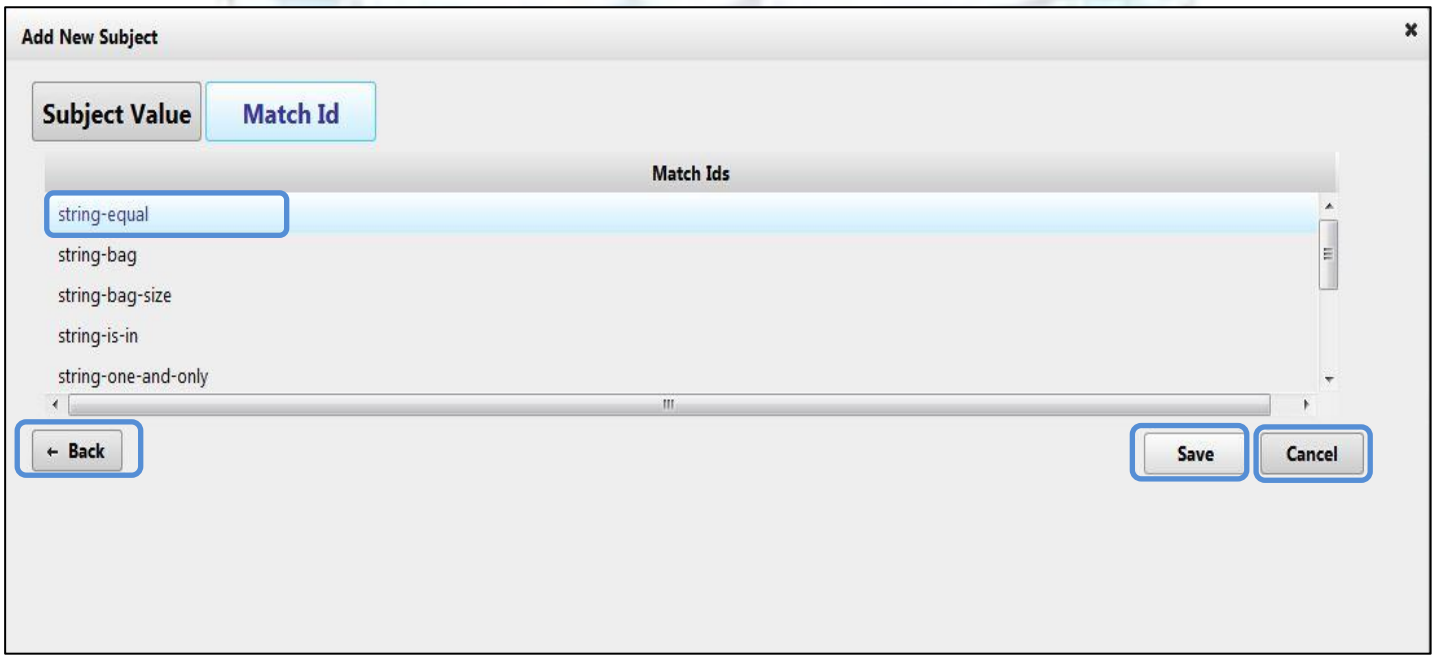
a-1) Click on "+" option to add/update **Available Subjects** against the selected Target parameter. In the **Subject Value** tab, select Subject **Description** from the available list. As a result of this selection, list of available Subject Attributes is displayed.



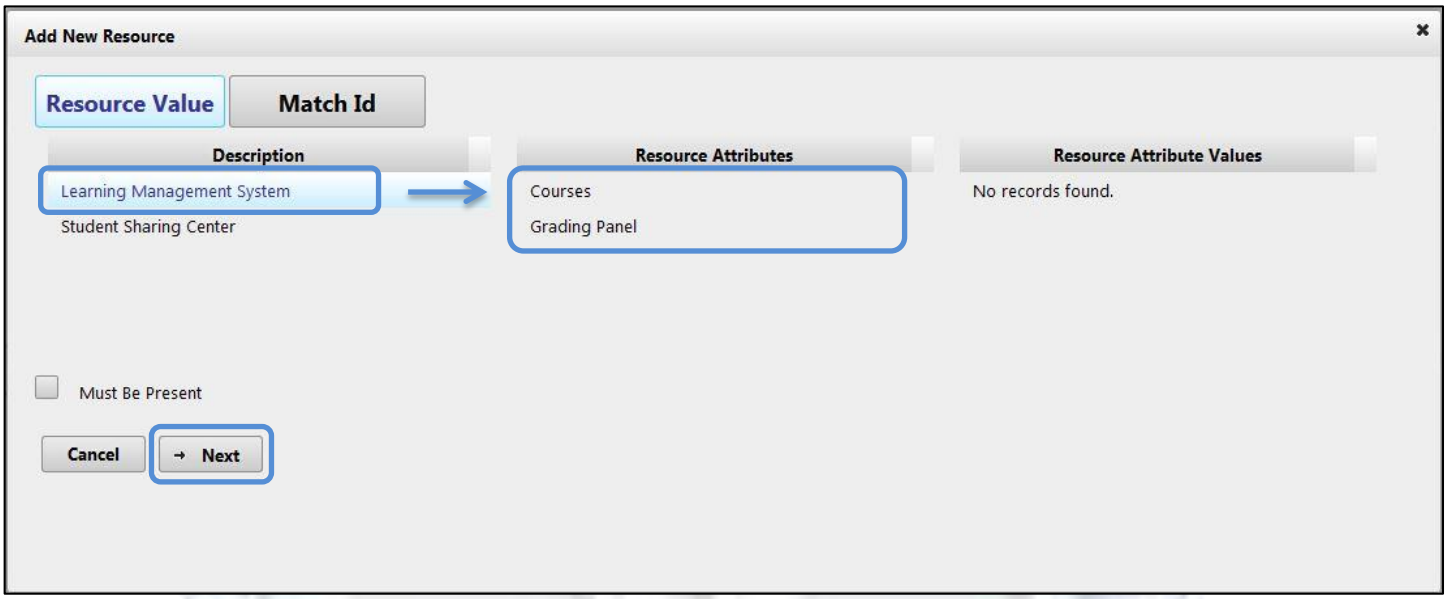
a-2) Click on any of the **Subject Attribute** from the available list to view its values. As a result, a complete list of possible values is displayed under **Subject Attribute Values** tab, select any particular value and click **Next**.



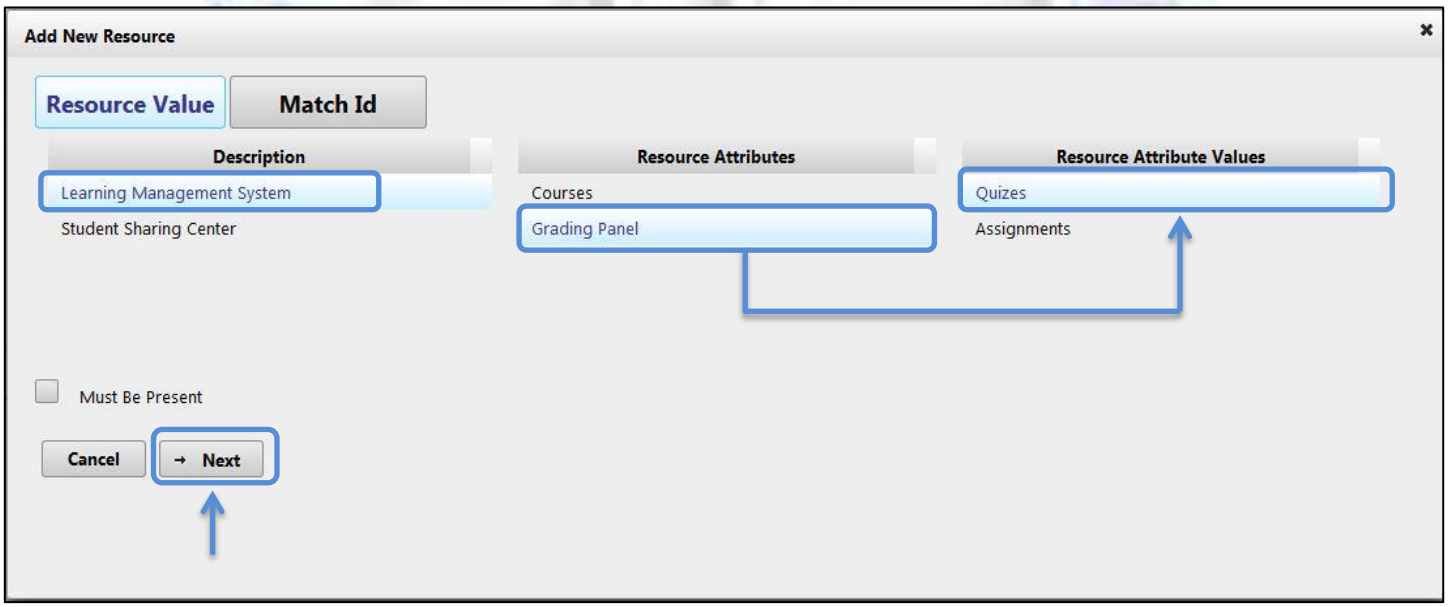
a-3) In the **Match Id** tab, list of possible match Ids for the previously selected Subject value is presented. Select any match Id value from the available list and click **Save** to add the selection (**Subject Value** and **Match Id**) against the individual Target. Whereas, click on **Back** button will take you back to the **Subject Value** interface and **Cancel** will discard all the selections and return to the main **Target** interface.



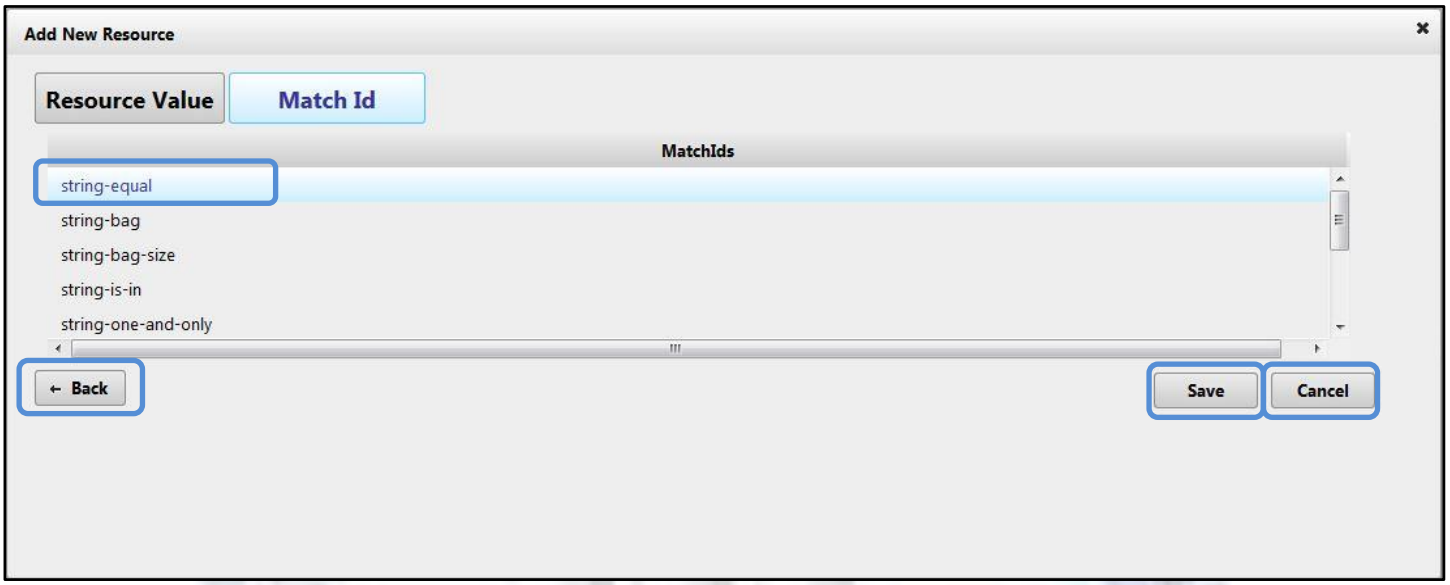
b-1) Click on "+" option to add/update **Available Resource** against the selected Target parameter. In the **Resource Value** tab, select Resource **Description** from the available list. As a result of this selection, list of available Resource Attributes is displayed.



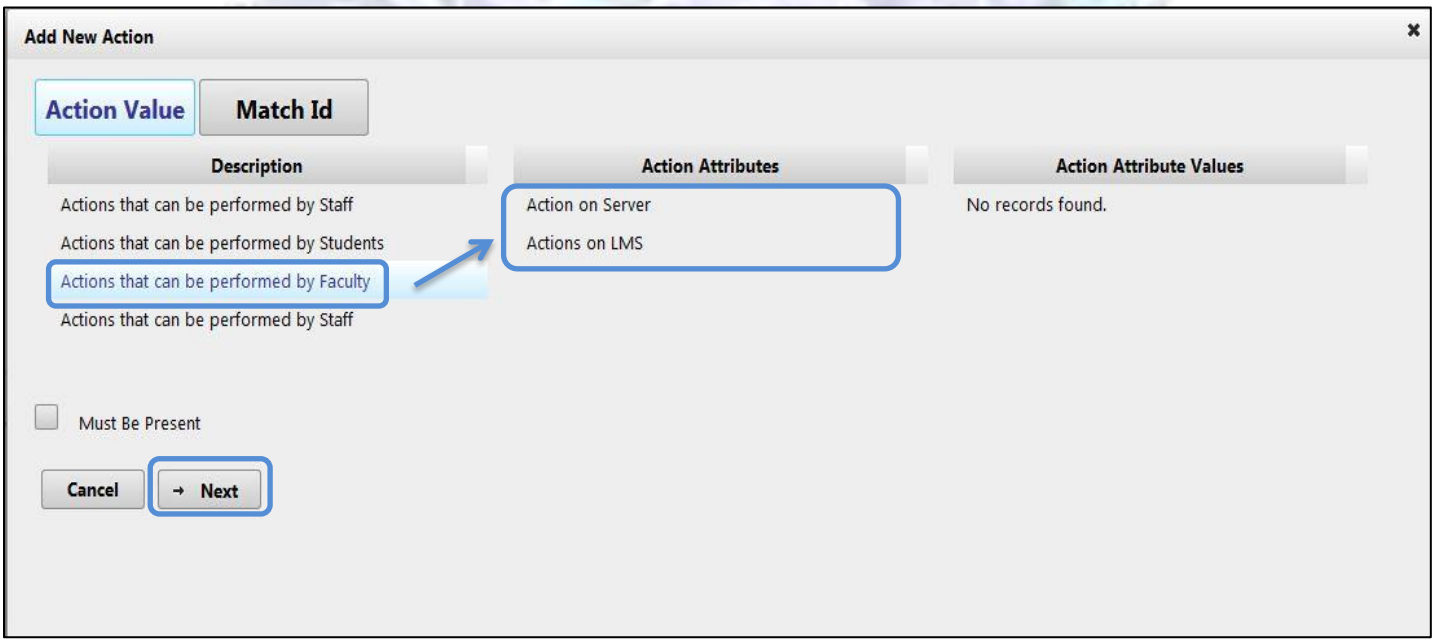
b-2) Click on any of the **Resource Attribute** from the available list to view its values. As a result, a complete list of possible values is displayed under **Resource Attribute Values** tab, select any particular value and click **Next.**



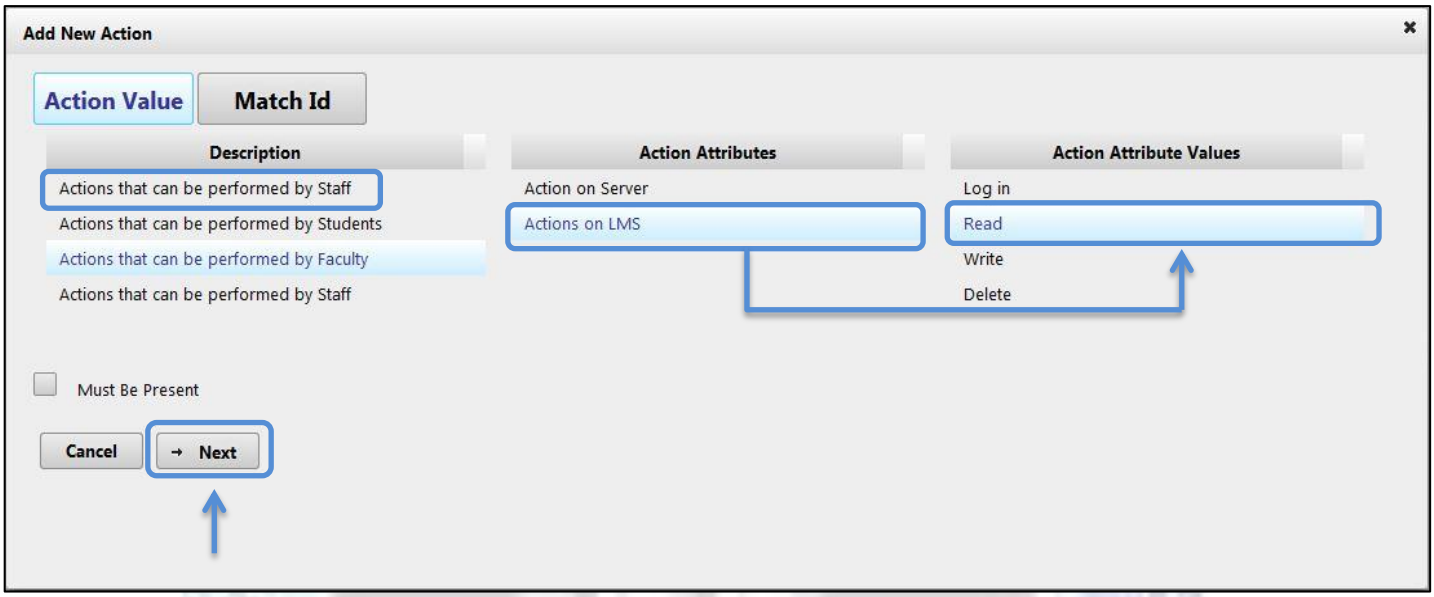
b-3) In the **Match Id** tab, list of possible match ids for the previously selected Resource value is presented. Select any match Id value from the available list and click **Save** to add the selection (**Resource Value** and **Match Id**) against the individual Target. Whereas, click on **Back** button will take you back to the **Resource Value** interface and **Cancel** will discard all the selections and return to the main **Target** interface.



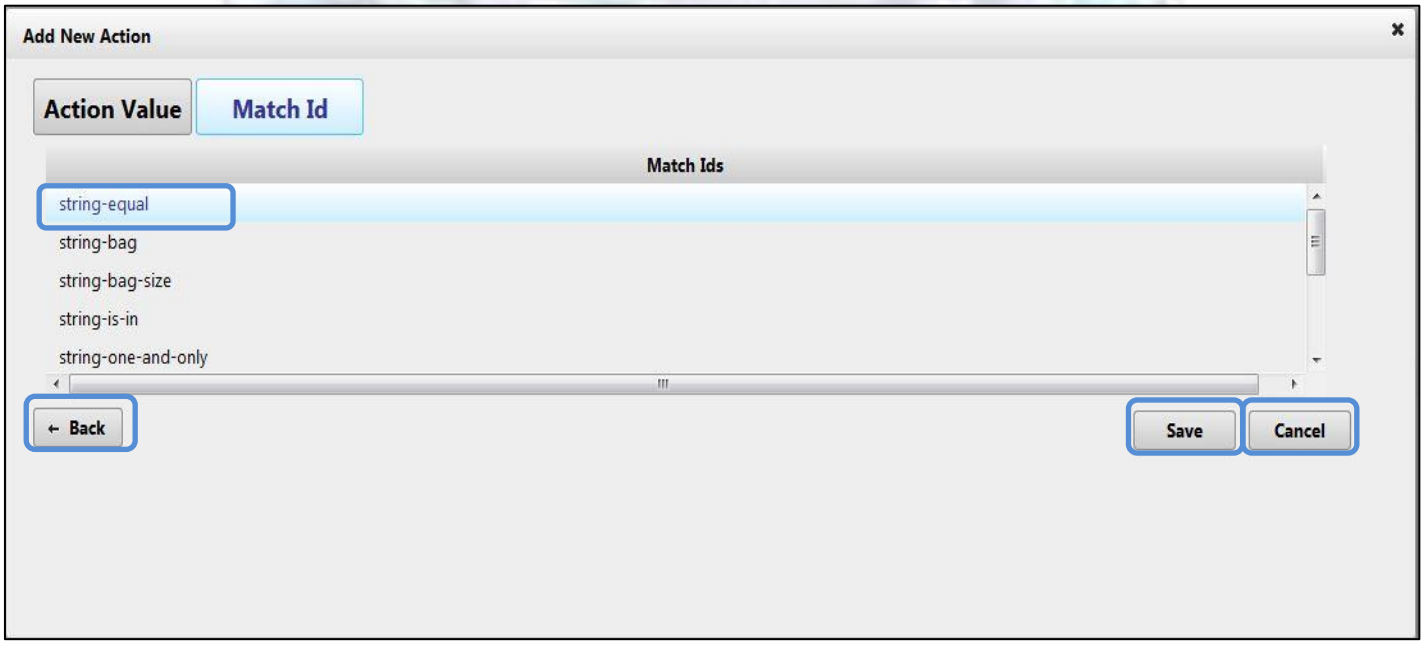
c-1) Click on "+" option to add/update **Available Action** against the selected Target parameter. In the **Action Value** tab, select action **Description** from the available list. As a result of this selection, list of available Action Attributes is displayed.



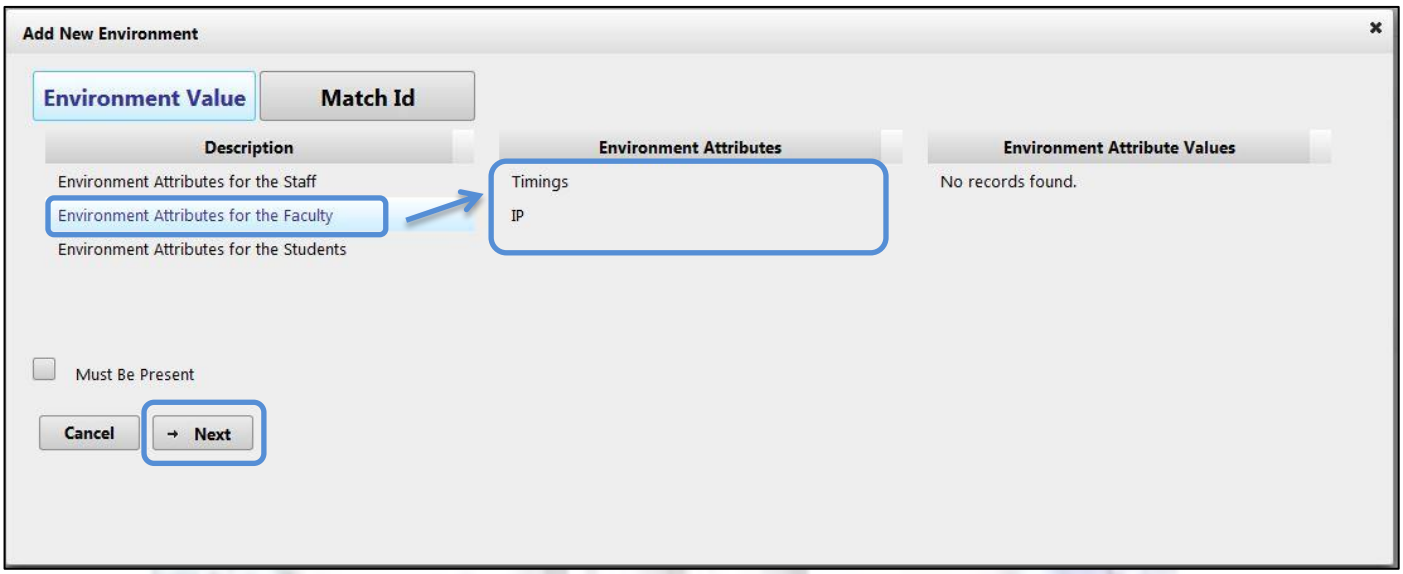
c-2) Click on any of the **Action Attribute** from the available list to view its values. As a result, a complete list of possible values is displayed under **Action Attribute Values** tab, select any particular value and click **Next.**



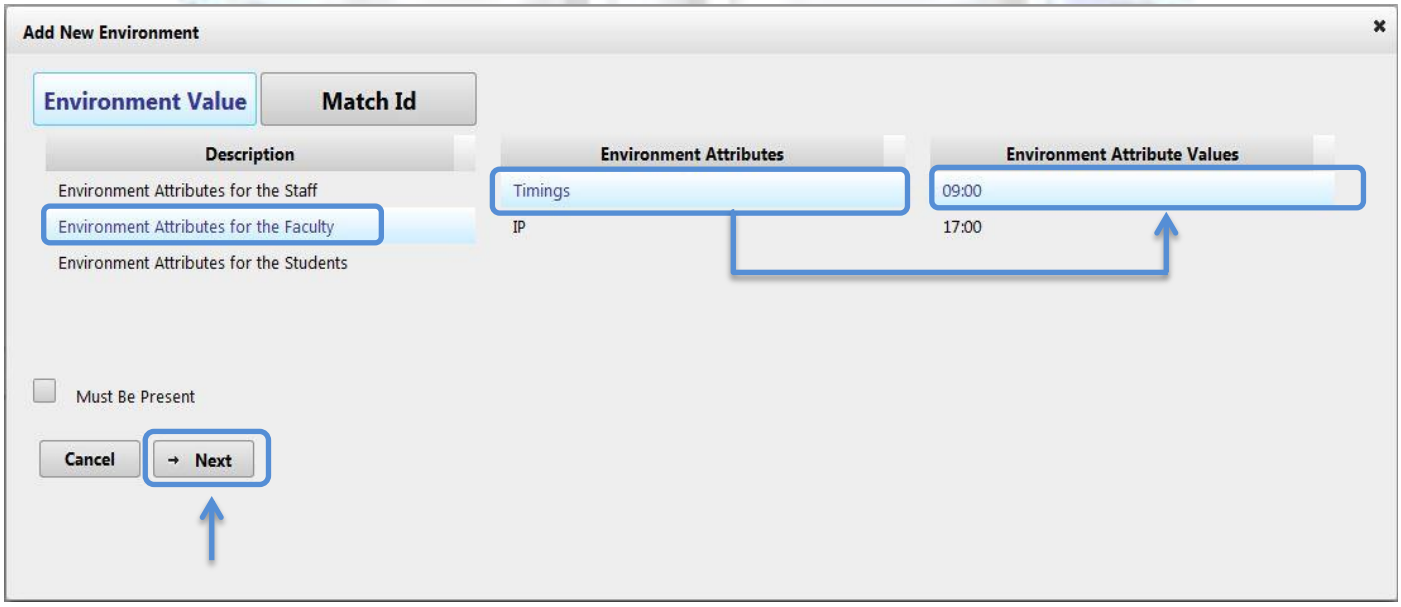
c-3) In the **Match Id** tab, list of possible match ids for the previously selected Action Value is presented. Select any match Id value from the available list and click **Save** to add the selection (**Action Value** and **Match Id**) against the individual Target. Whereas, click on **Back** button will take you back to the **Action Value** interface and **Cancel** will discard all the selections and return to the main **Target** interface.



d-1) Click on "+" option to add/update **Available Environment** against the selected Target parameter. In the **Environment Value** tab, select Environment **Description** from the available list. As a result of this selection, list of available Environment Attributes is displayed.



d-2) Click on any of the **Environment Attribute** from the available list to view its values. As a result, a complete list of possible values is displayed under **Environment Attribute Values**

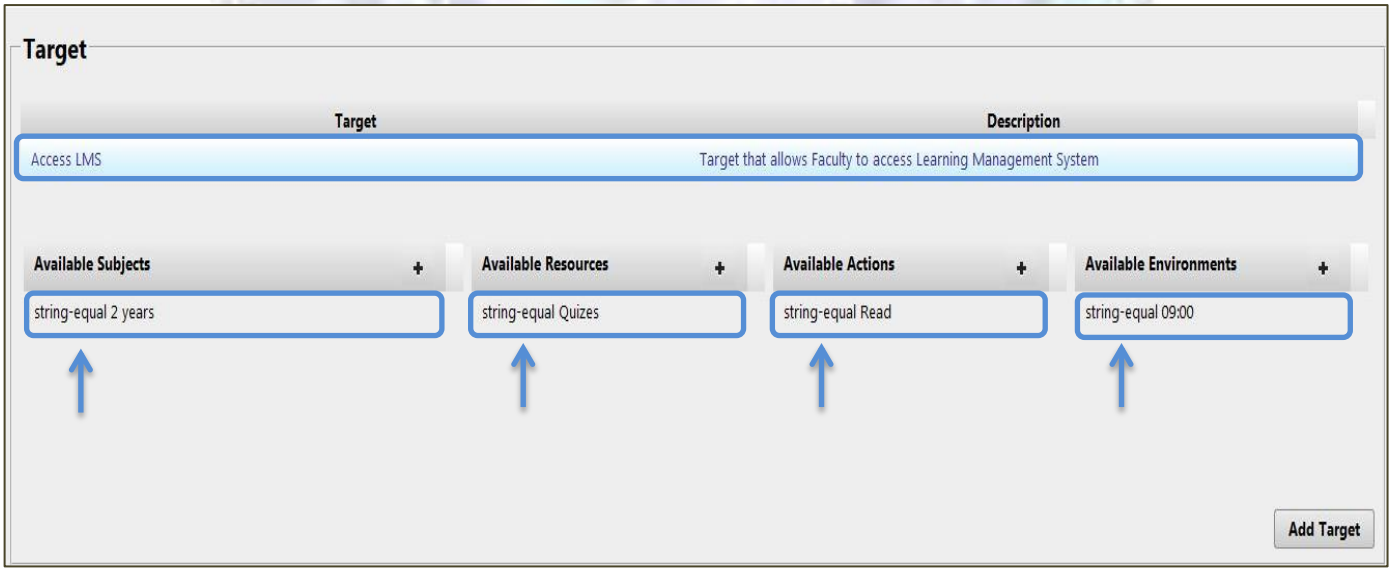


tab, select any particular value and click **Next.**

d-3) In the **Match Id** tab, list of possible match ids for the previously selected Environment Value is presented. Select any match Id value from the available list and click **Save** to add the selection (**Environment Value** and **Match Id**) against the individual Target. Whereas, click on **Back** button will take you back to the **Environment Value** interface and **Cancel**

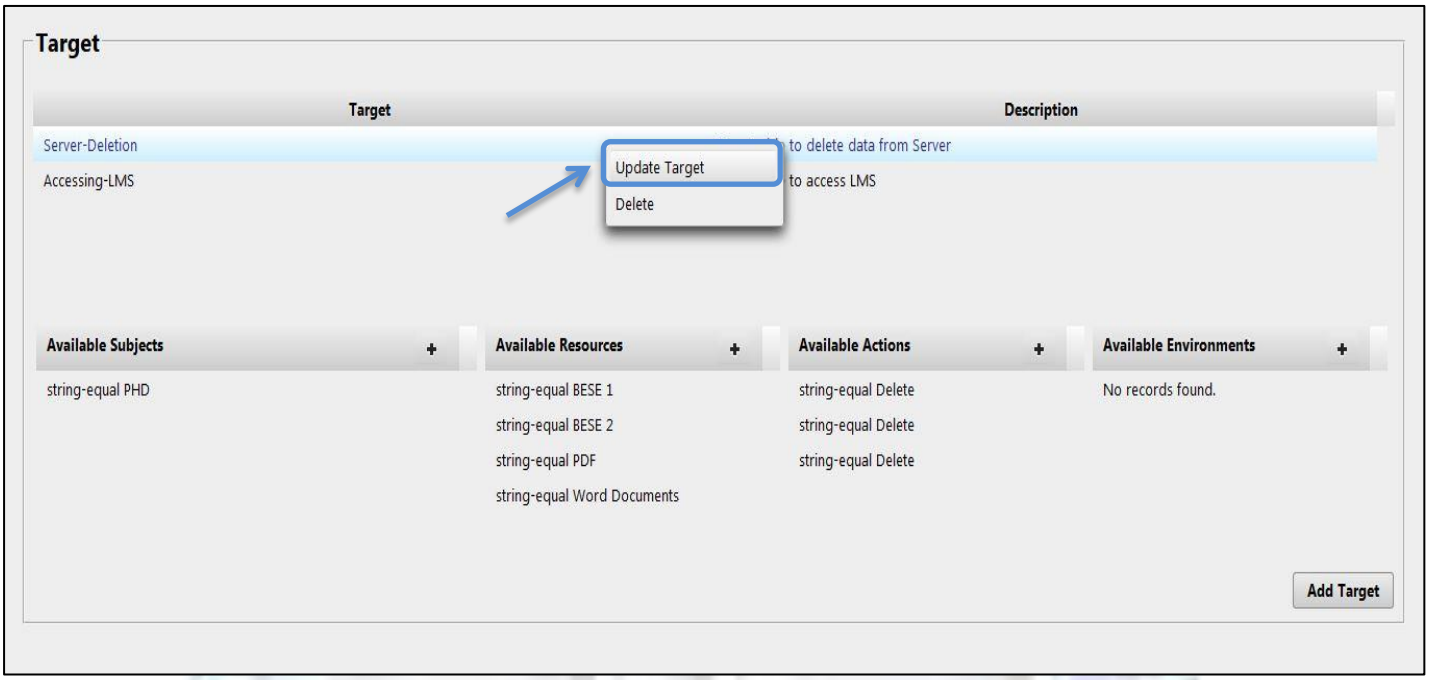
will discard all the selections and return to the main **Target** interface.

6. From the main **Target** interface, select any available **Target** to view all of its associated **Subjects, Actions, Resources and Environments**.

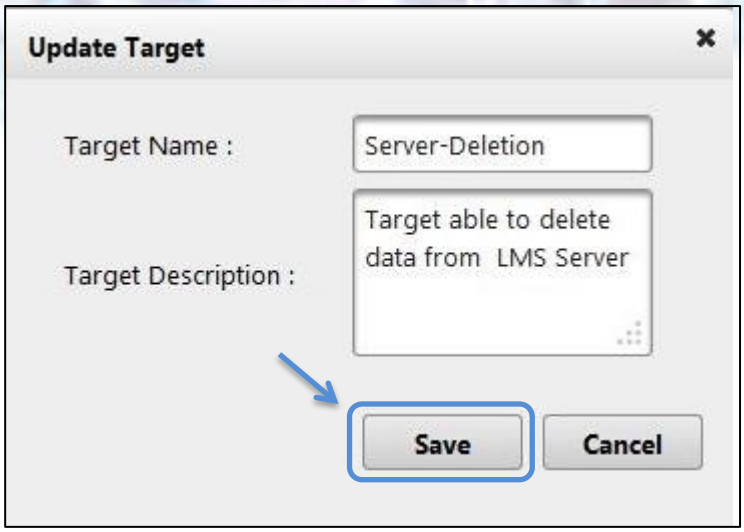


MT - 2: Update Target

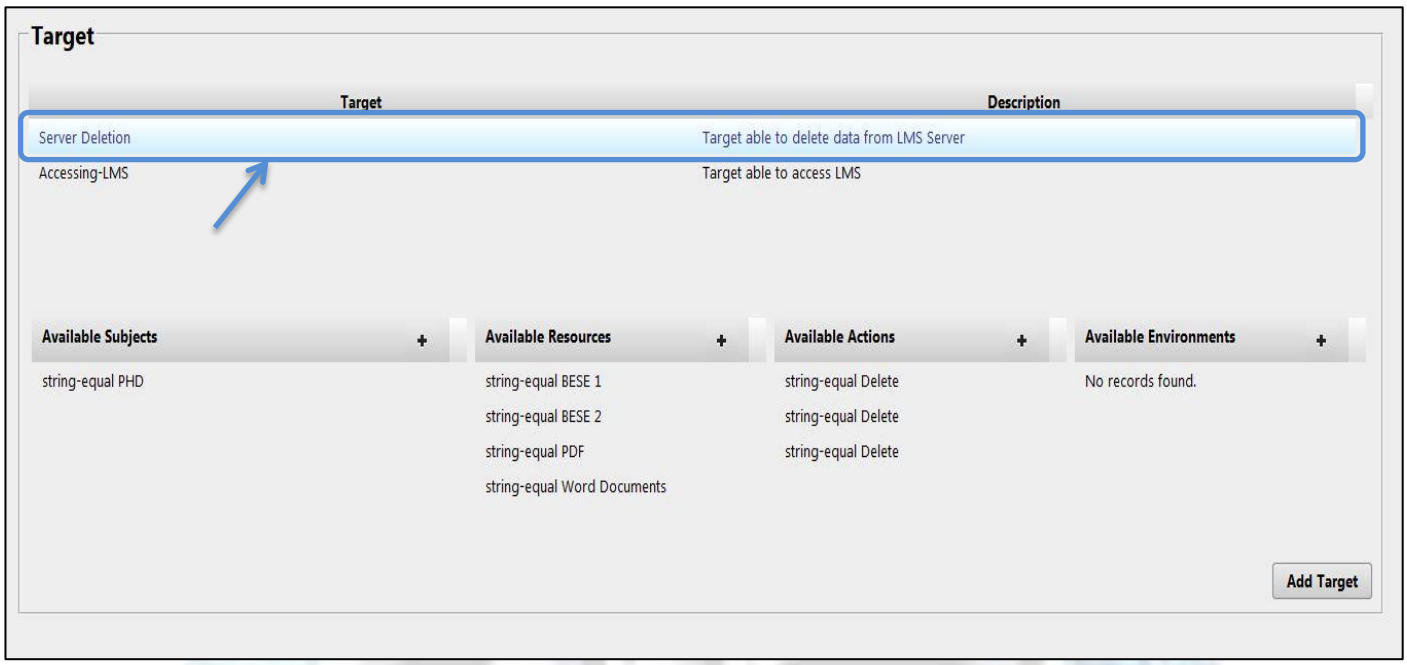
1. In order to update any existing **Target** parameter, right click on that specific Target and choose **Update** from the drop-down menu.



2. In the **Update Target** interface, edit any of the previously added Target attribute and click **Update** to save the changes into the database

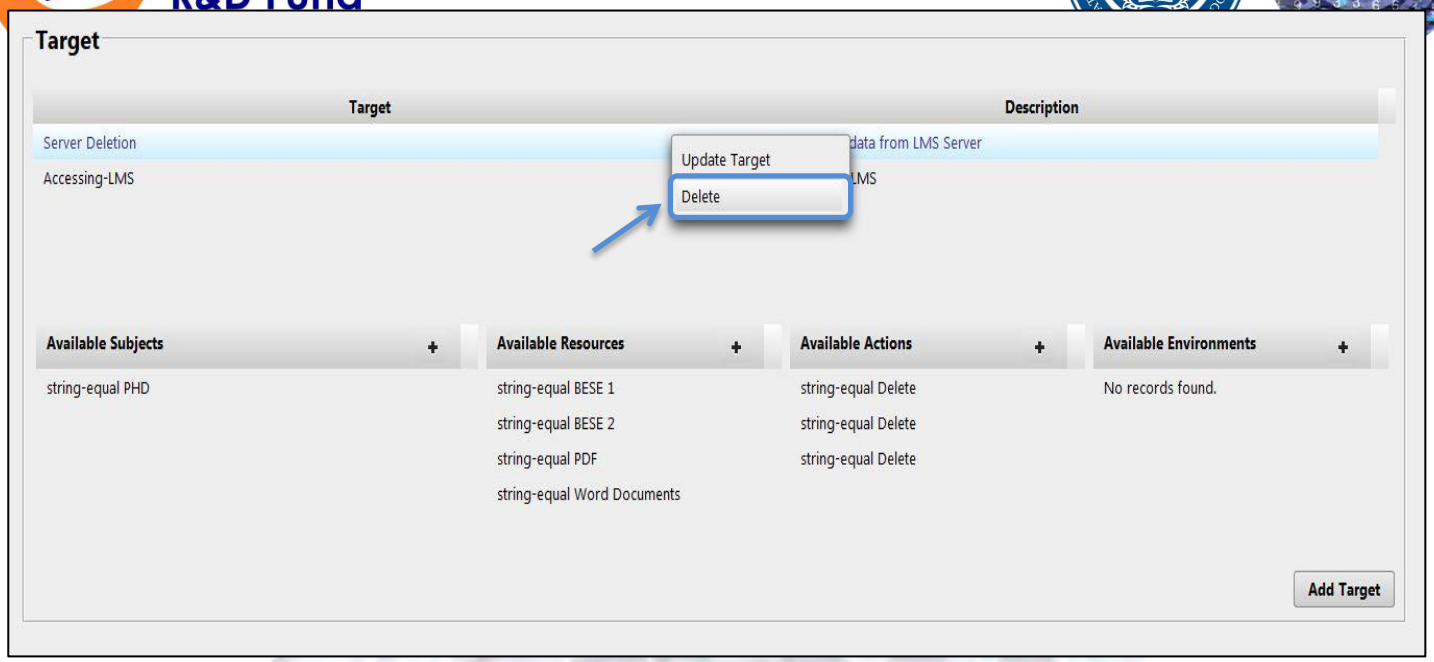


3. After the successful execution of update function, **Target** interface displays the list of updated Target parameters.

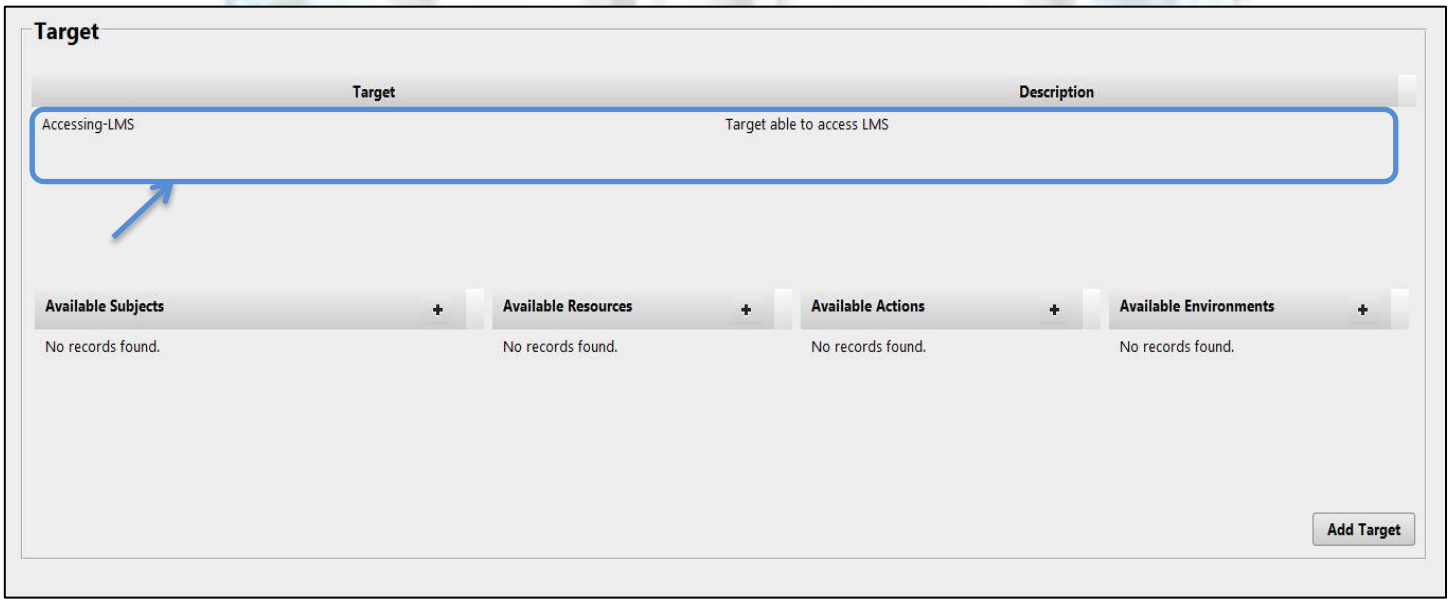


MT - 3: Delete Target

1. In order to **Delete** any of the existing **Target**, right click on that particular Target and select **Delete** from the menu.

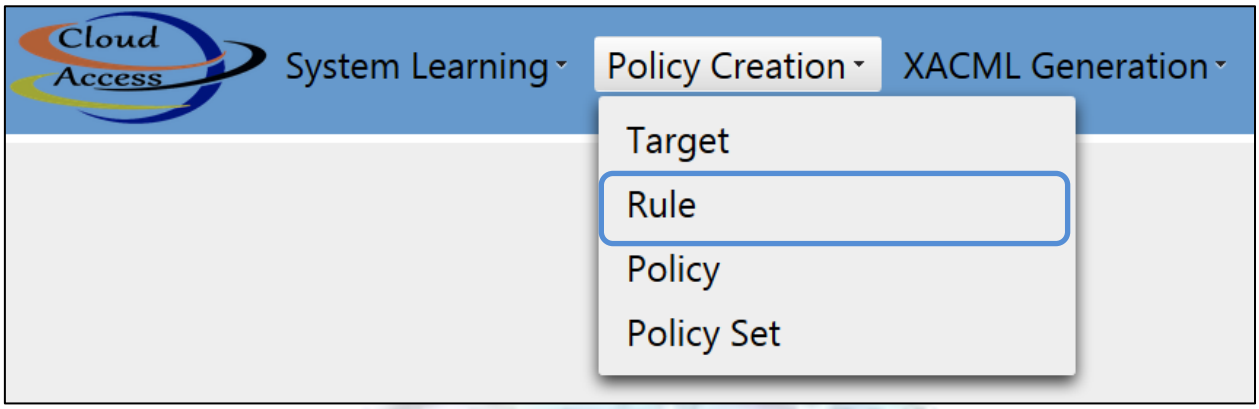


2. After the successful deletion of selected **Target**, updated list of available Target parameters is displayed on the **Target** interface.



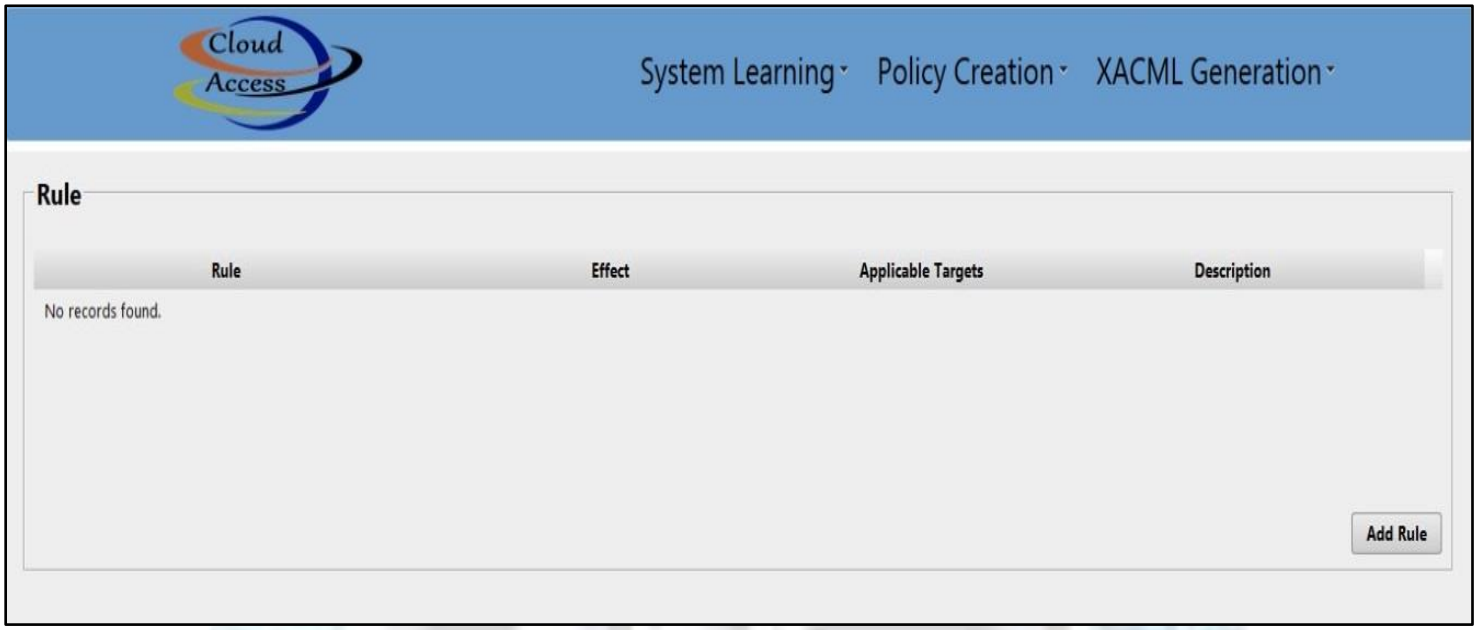
PC - 2. Manage Rule:

In order to add, update and delete **Rule** and its corresponding Target parameter, select **Rule** from the main **Policy Creation** dropdown-menu.

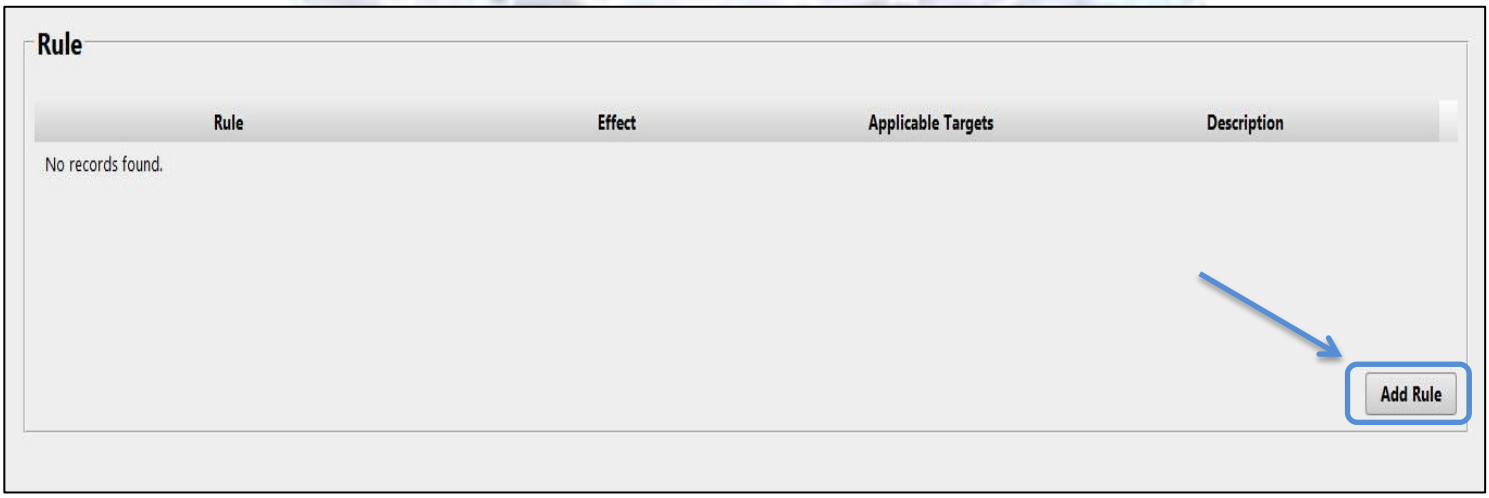


MU - 1: Create Rule

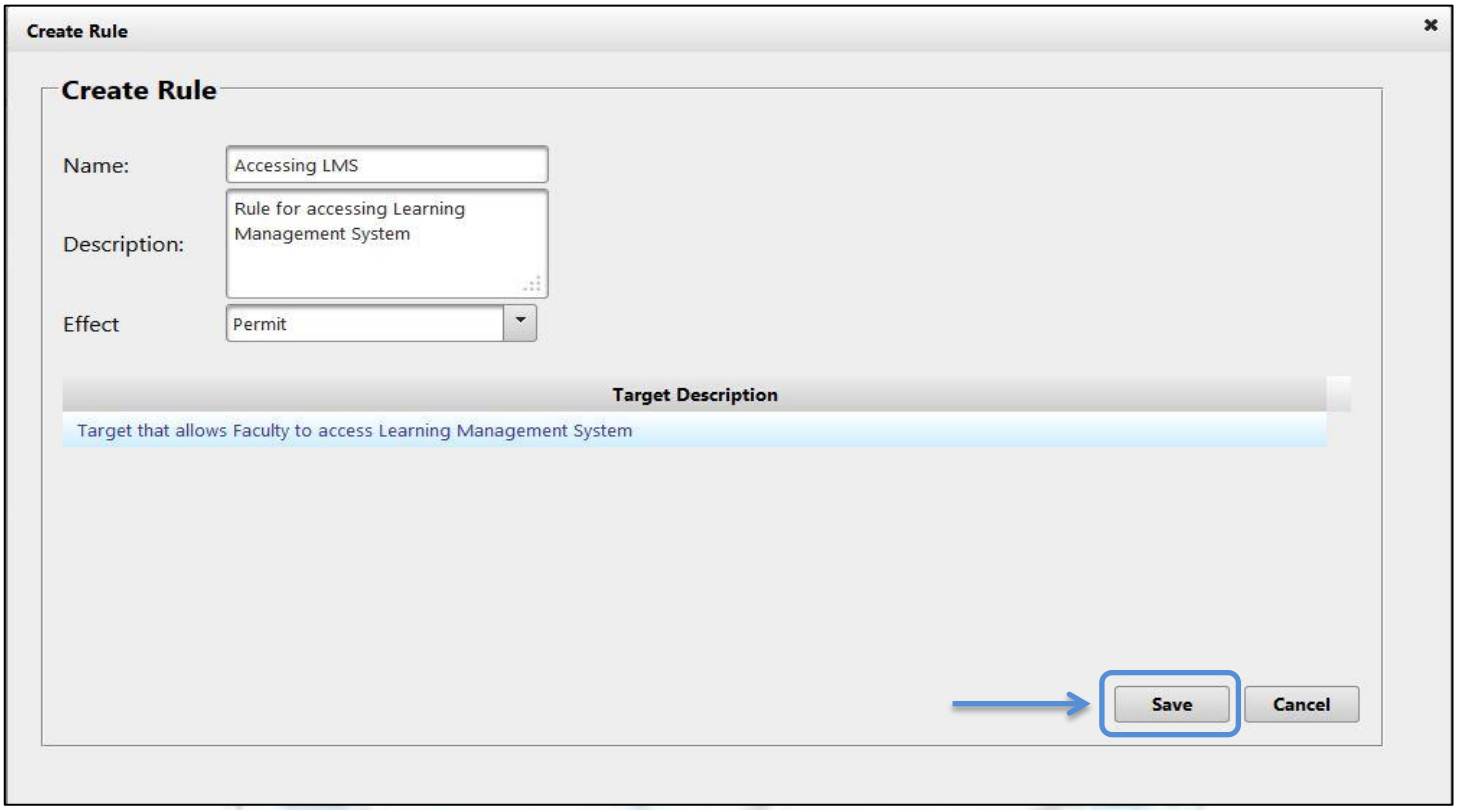
1. Below is the main **Rule** interface, which is used to add, update and delete Rule and its related parameters.



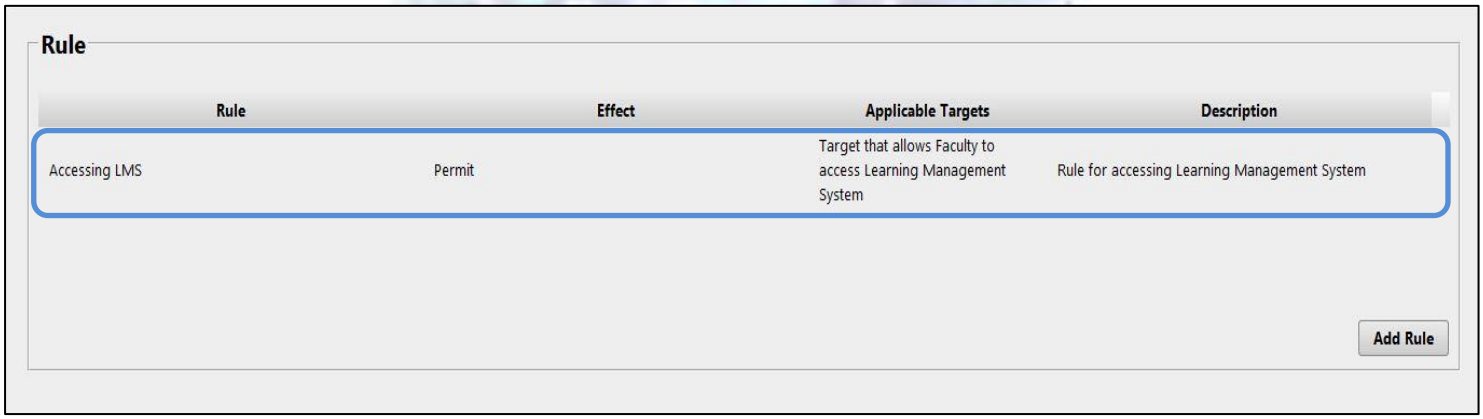
2. Click on **Add Rule** button, to add new Rule parameter into the database.



3. In the **Create Rule** interface, specify Rule Name, Description and its corresponding Effect and click on **Save** to insert the new Rule parameter into the database and **Cancel** to discard the added information.

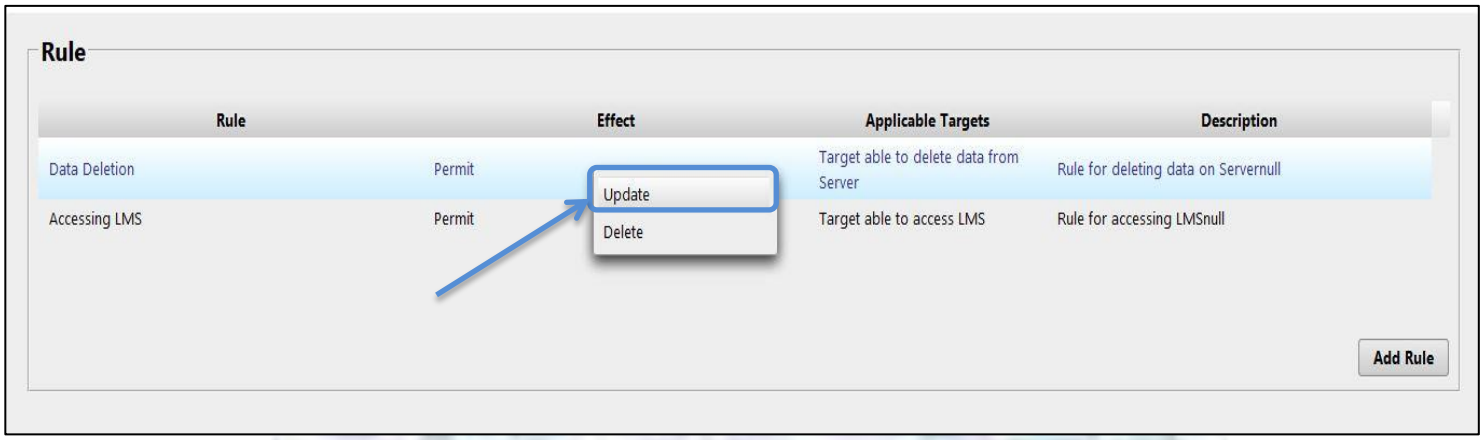


4. Upon successful creation of Rule, its Name, Effect, Applicable targets and Description appears in the main **Rule** interface

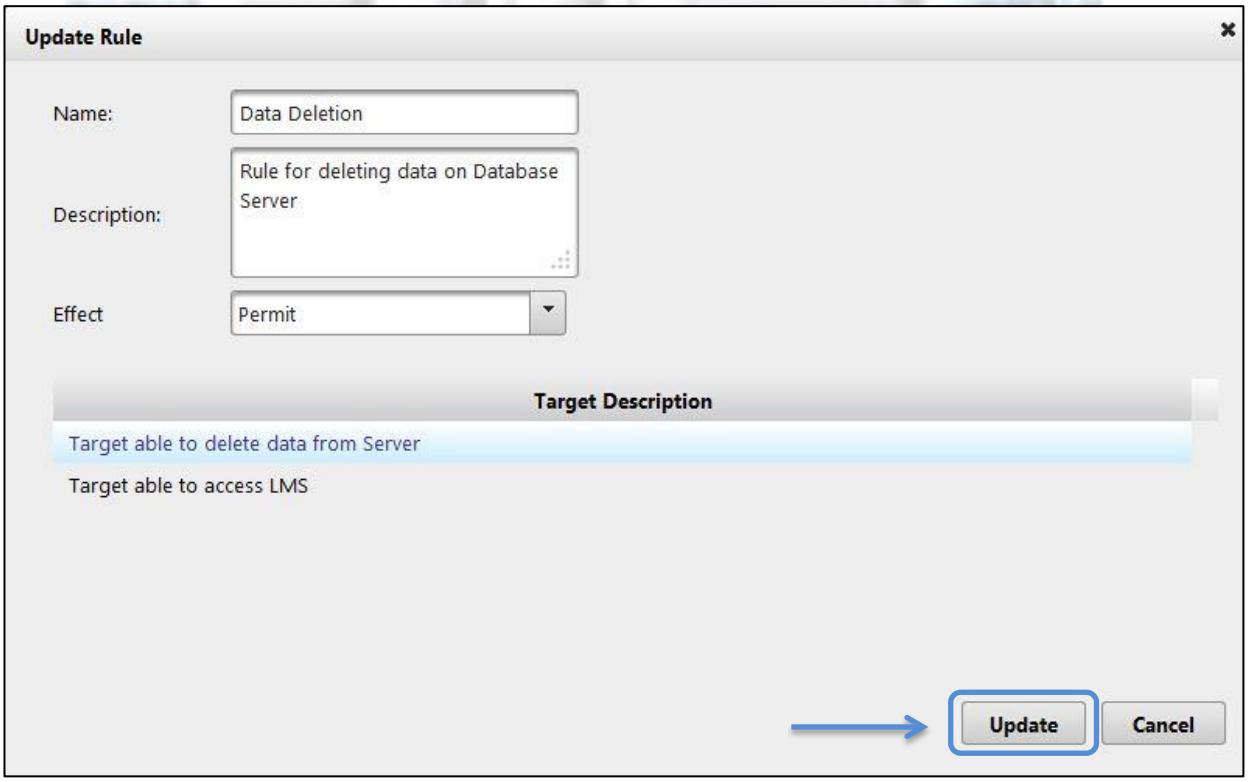


MU - 2: Update Rule

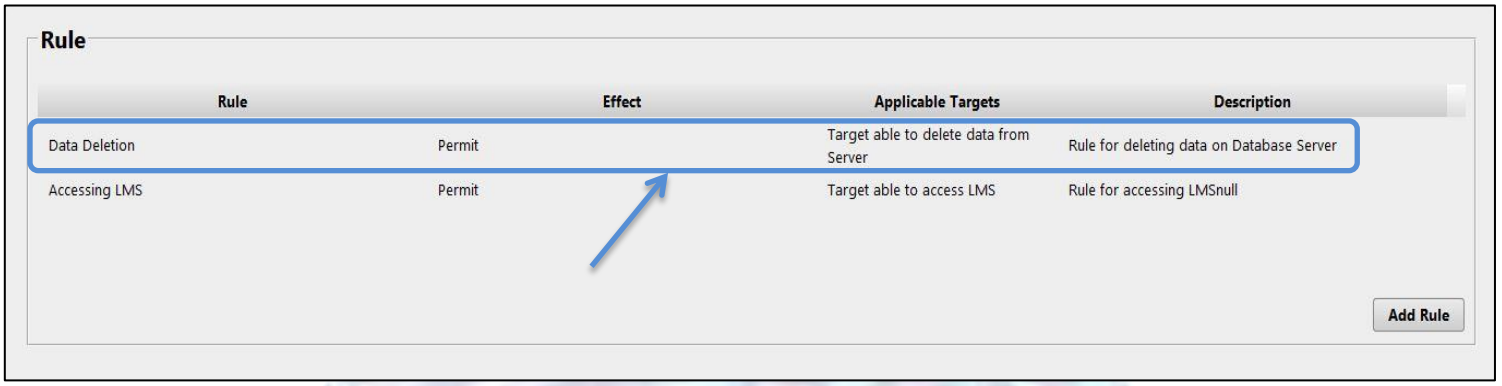
1. In order to update any existing Rule parameter, right click on that specific Rule and choose **Update** from the displayed menu



2. In the **Update Rule** interface, edit any of the previously added Rule attribute and click **Update** to save the changes into the database

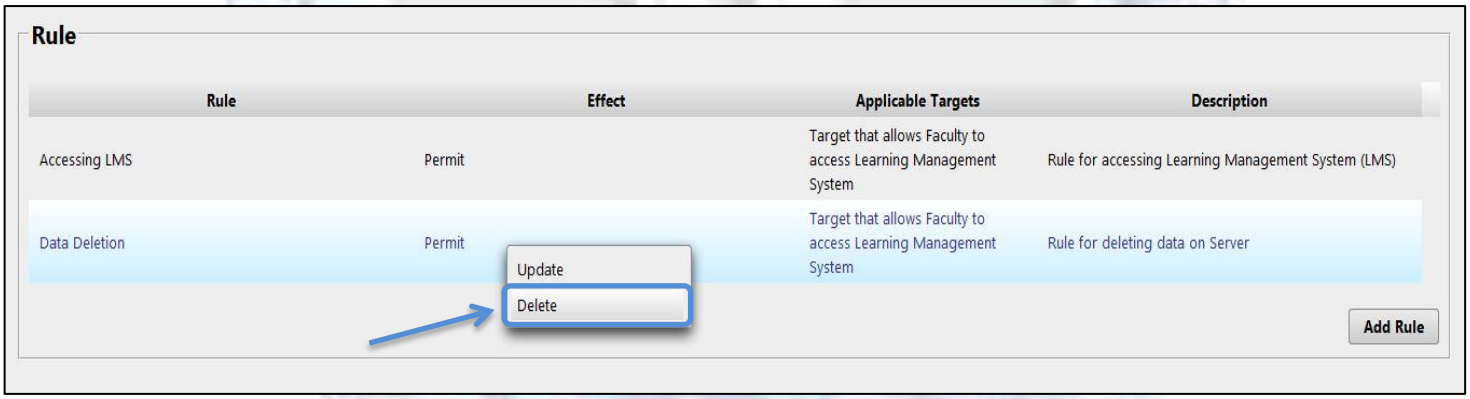


3. After the successful execution of update function, **Rule** interface displays the list of updated Rule parameters.

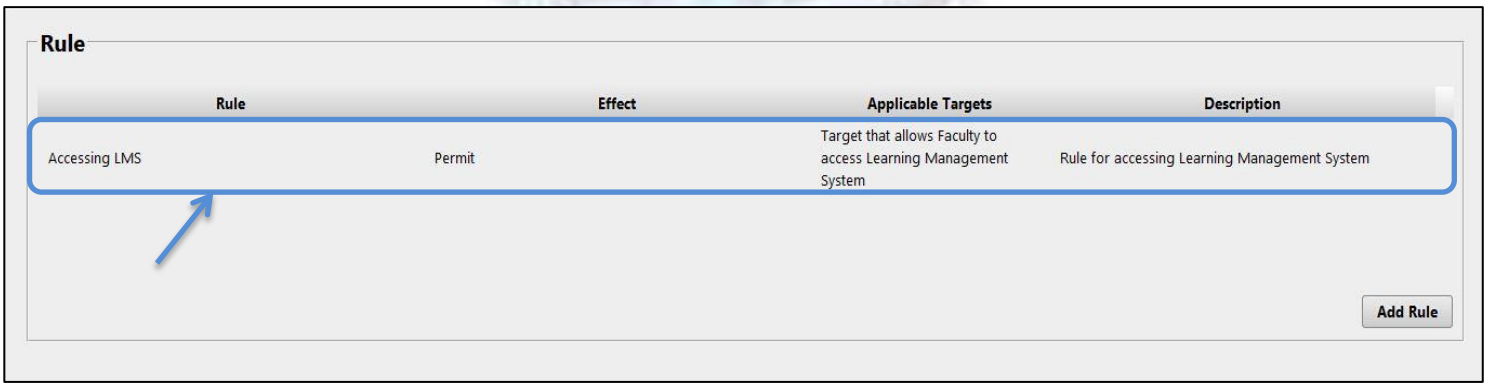


MU - 3: Delete Rule

1. In order to **Delete** any of the existing **Rule**, right click on that particular Rule and select **Delete** from the menu

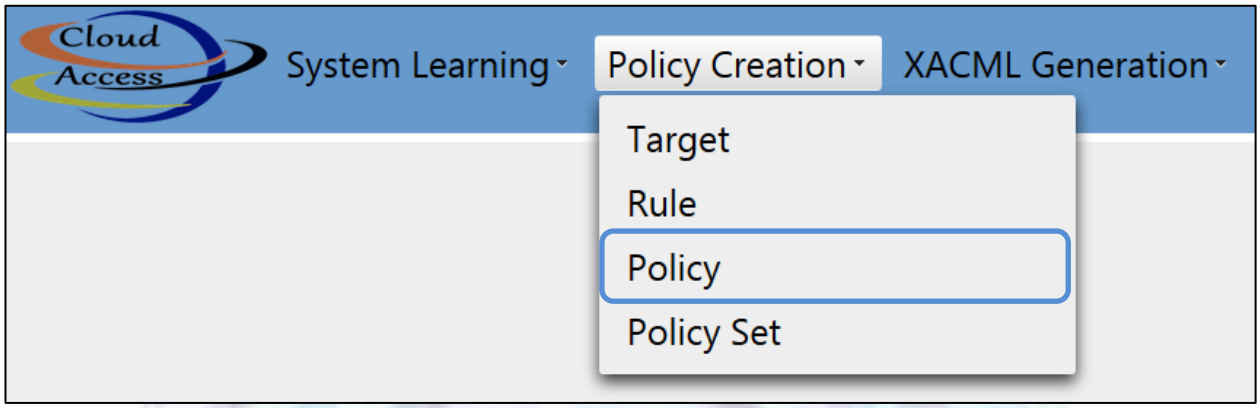


2. After the successful deletion of selected **Rule**, updated list of available Rule parameters is displayed on the **Rule** interface



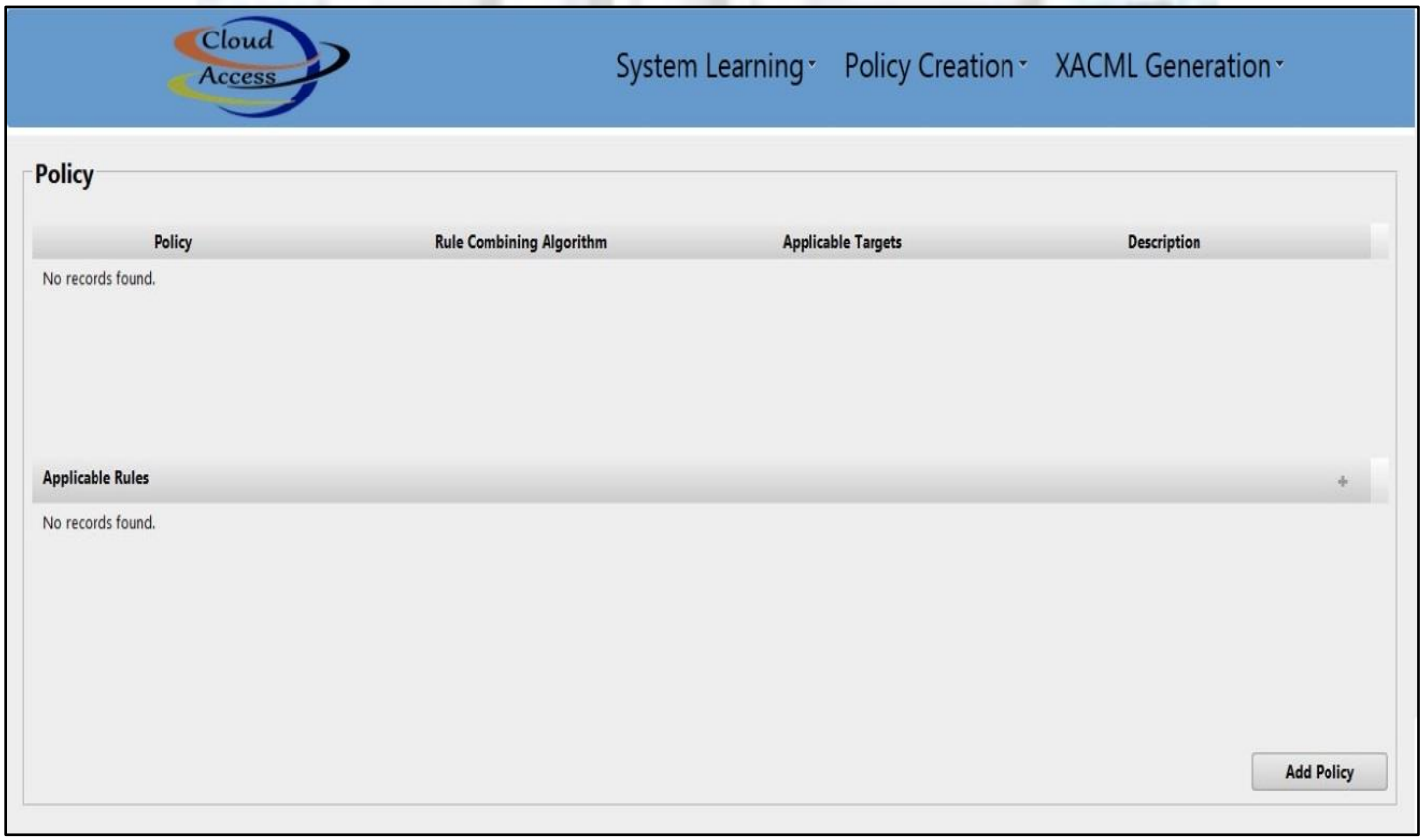
PC - 3. Manage Policy:

In order to add, update and delete **Policy** and its related parameters including Target and Rule, select **Policy** from the main **Policy Creation** dropdown-menu.



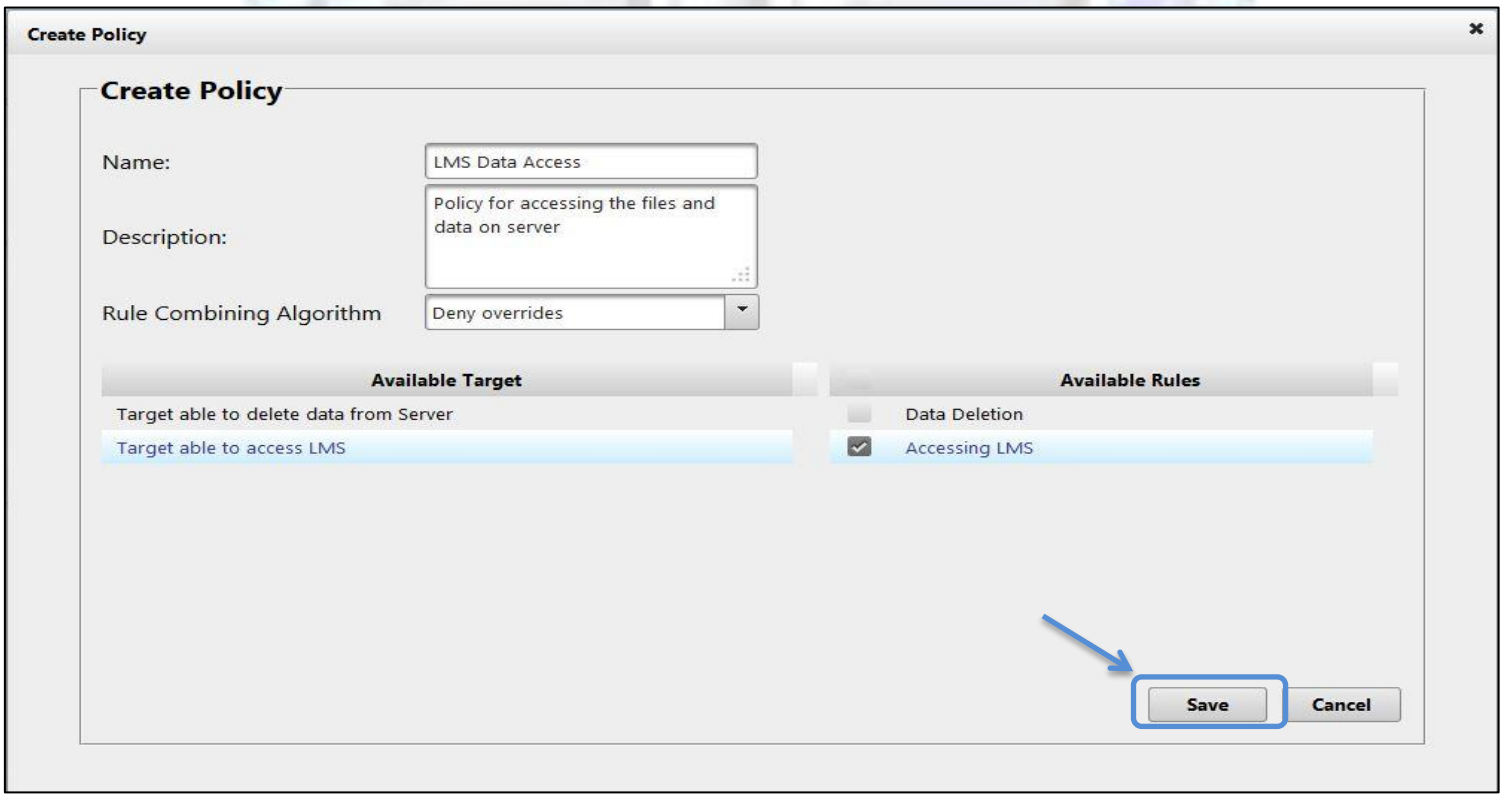
MP - 1: Create Policy

1. Below is the main **Policy** interface, which is used to add, update and delete Policy and its related parameters

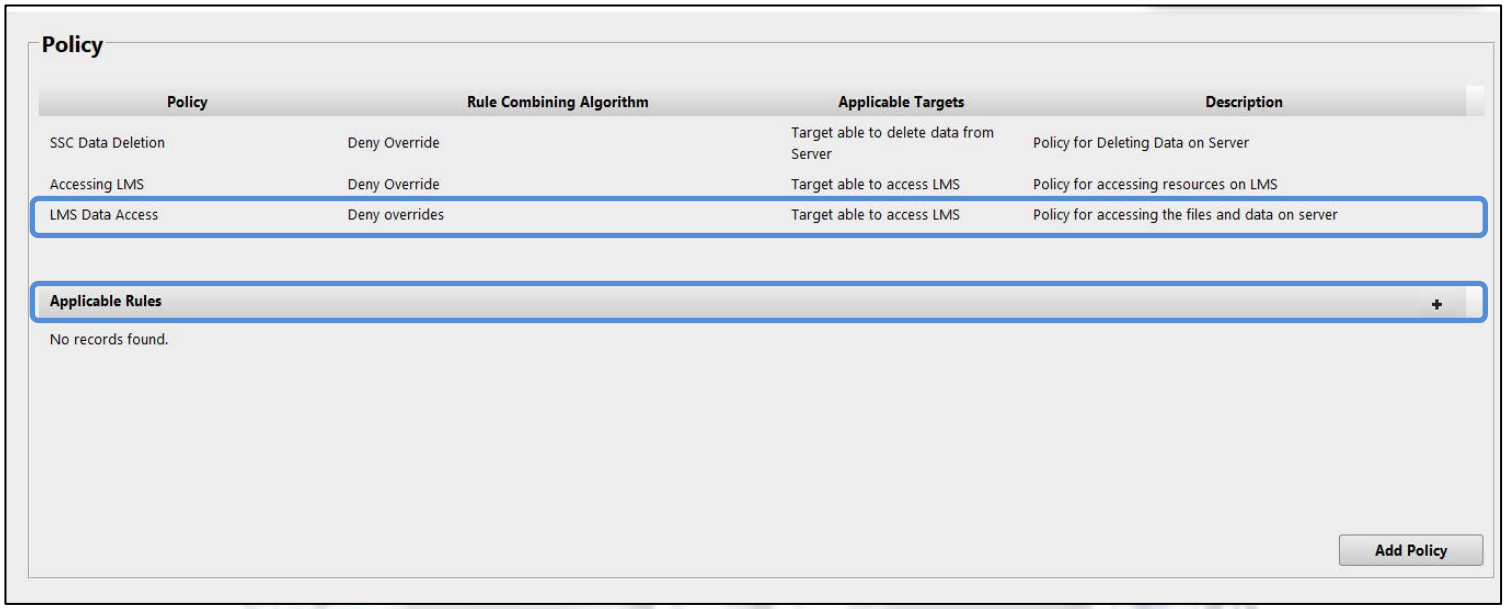


2. Click on **Add Policy** button, to add new Policy parameter into the database.

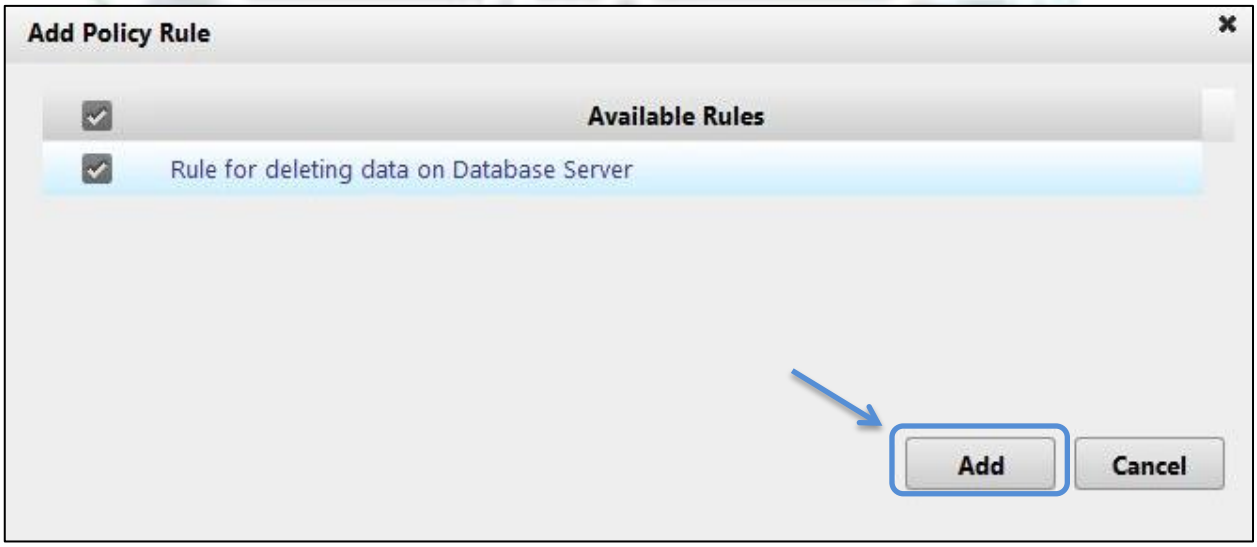
3. In the **Create Policy** interface, specify Policy Name, Description, Rule combining Algorithm along with the desired Target parameter and their corresponding Rules. Click on **Save** to insert the new Policy parameter into the database and **Cancel** to discard the added information



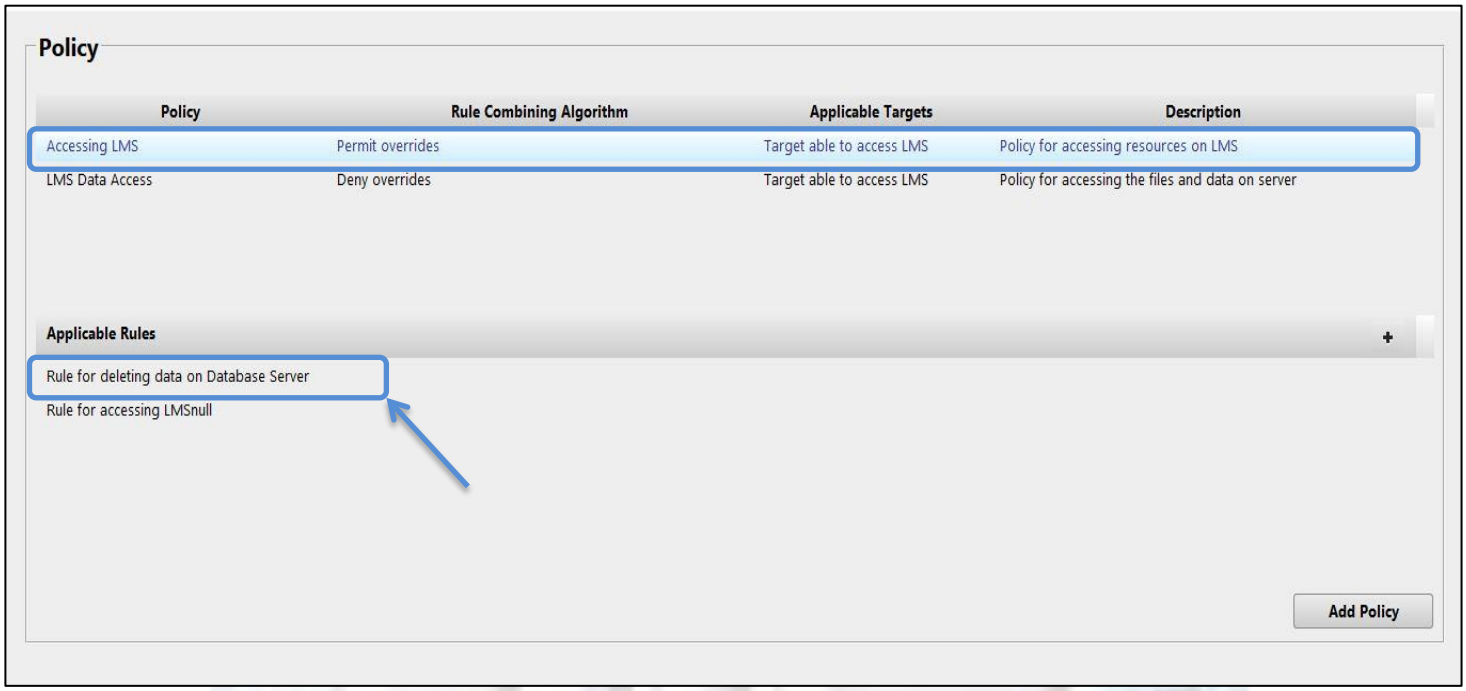
4. After the successful creation of Policy, its Name, Description, Rule Combining Algorithm and Applicable Target is shown in the **Policy** interface. Selecting any Policy from the available list enables the add/update "+" option for **Applicable Rules**.



5. Click on "+" option to add **Available Rules** to the selected Policy. In the **Add Policy Rule** interface, Check/select the Rule description that you want to add to the selected Policy and click **Add** to save the association in the database and **Cancel** to exit the interface.

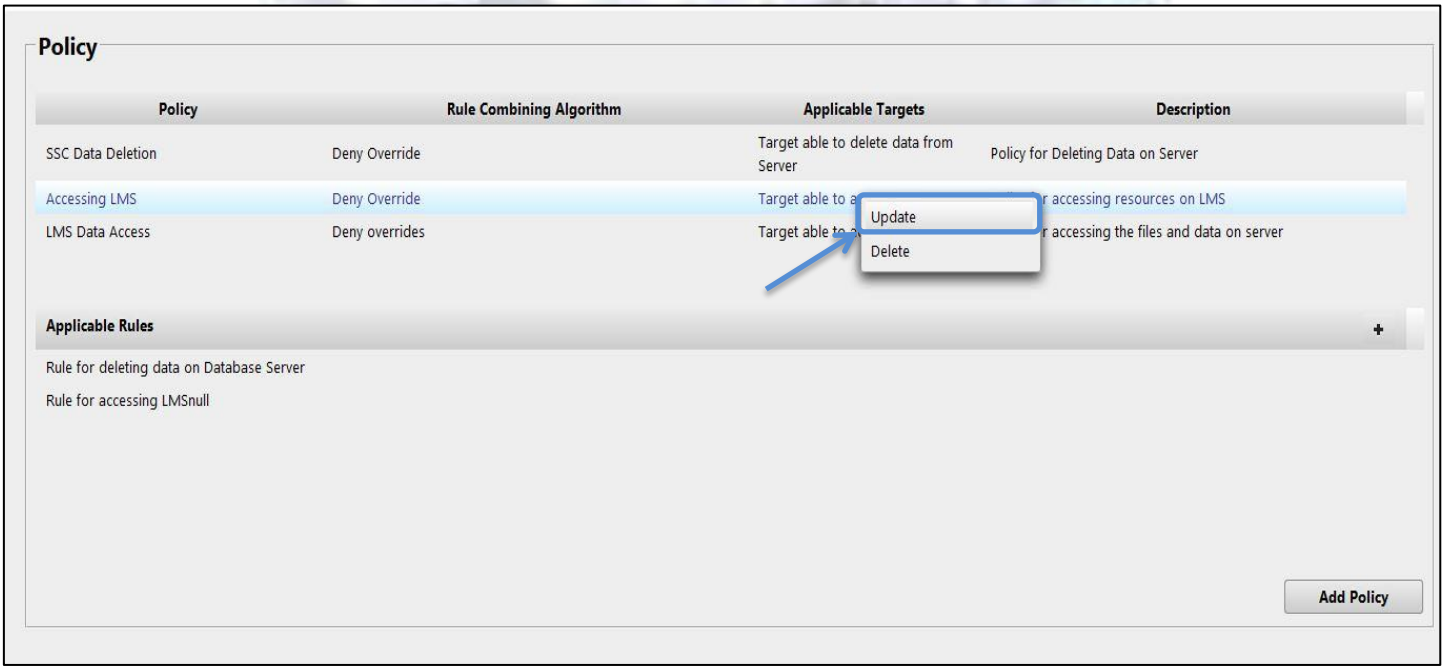


6. If saved, newly added **Applicable Rules** appear in the main **Policy** interface against the selected Policy.

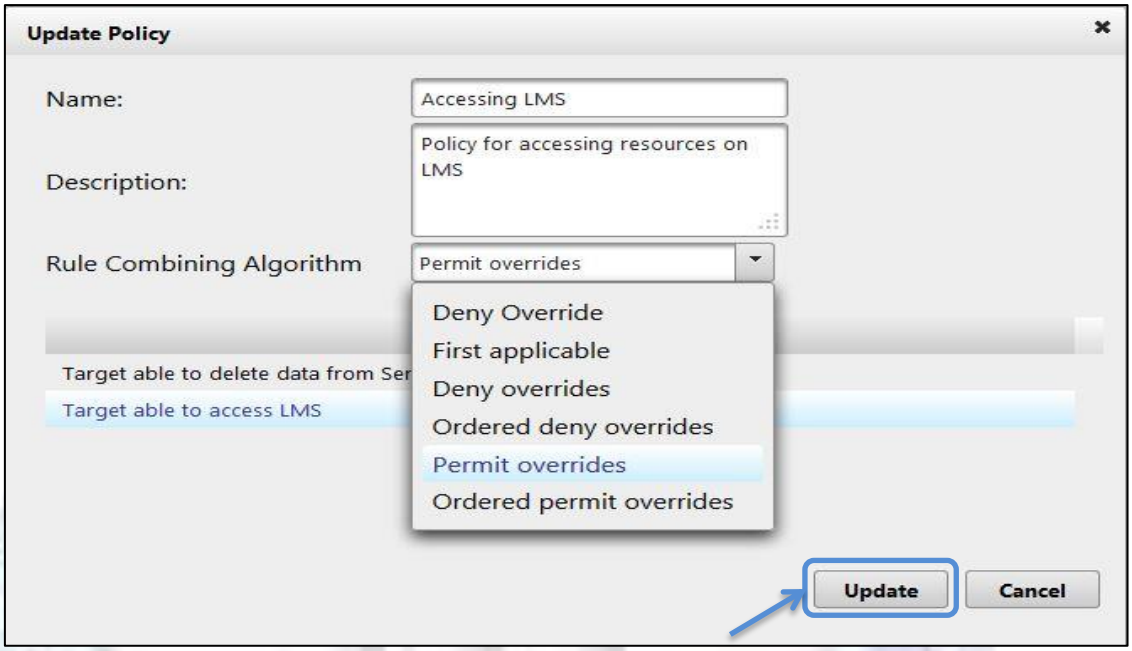


MP - 2: Update Policy

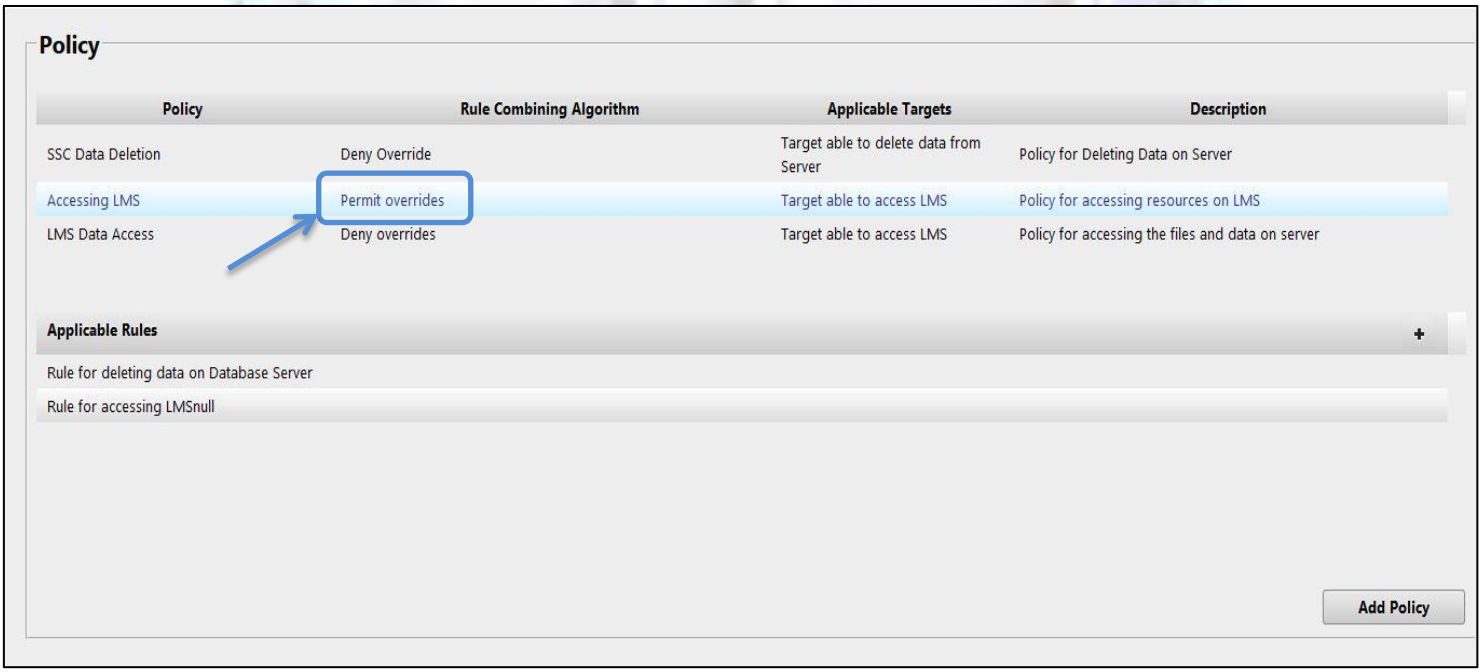
1. In order to update any of the existing **Policy**, right click on that specific Policy and choose **Update** from the displayed menu



2. In the **Update Policy** interface, edit any of the previously added Policy attribute and click **Update** to save the changes into the database

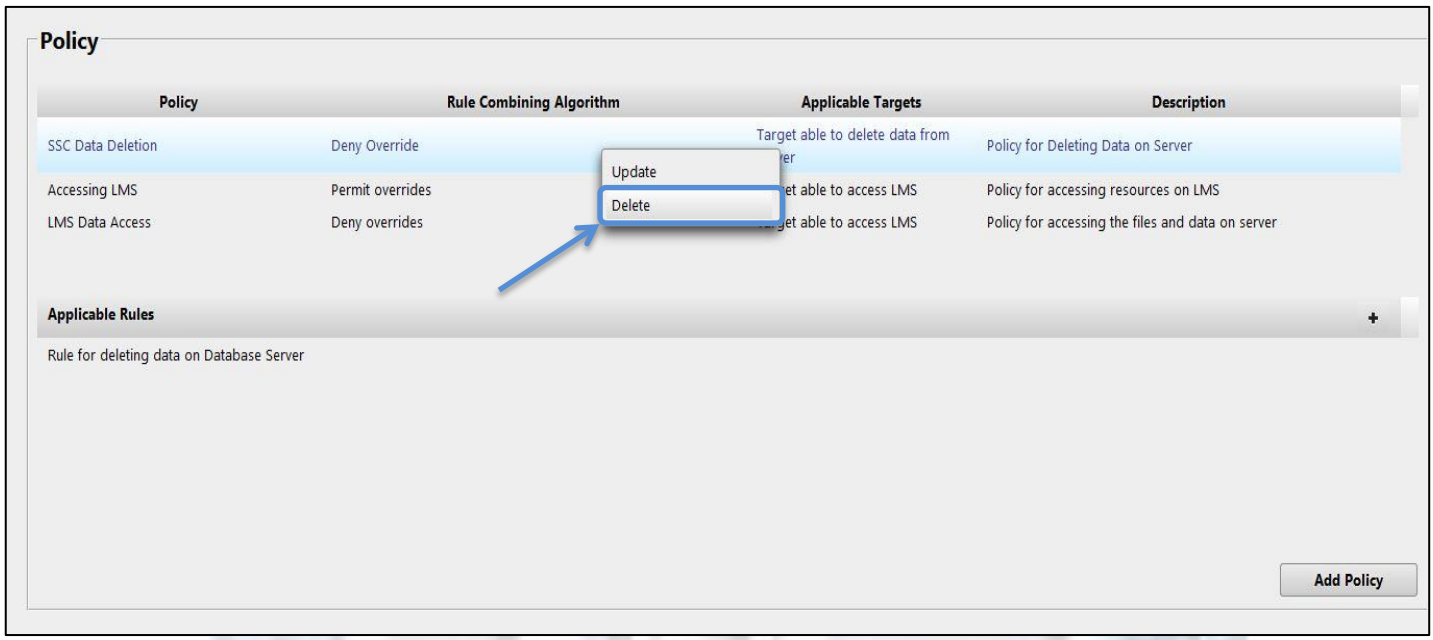


3. After the successful execution of update function, **Policy** interface displays the list of updated Policy parameters

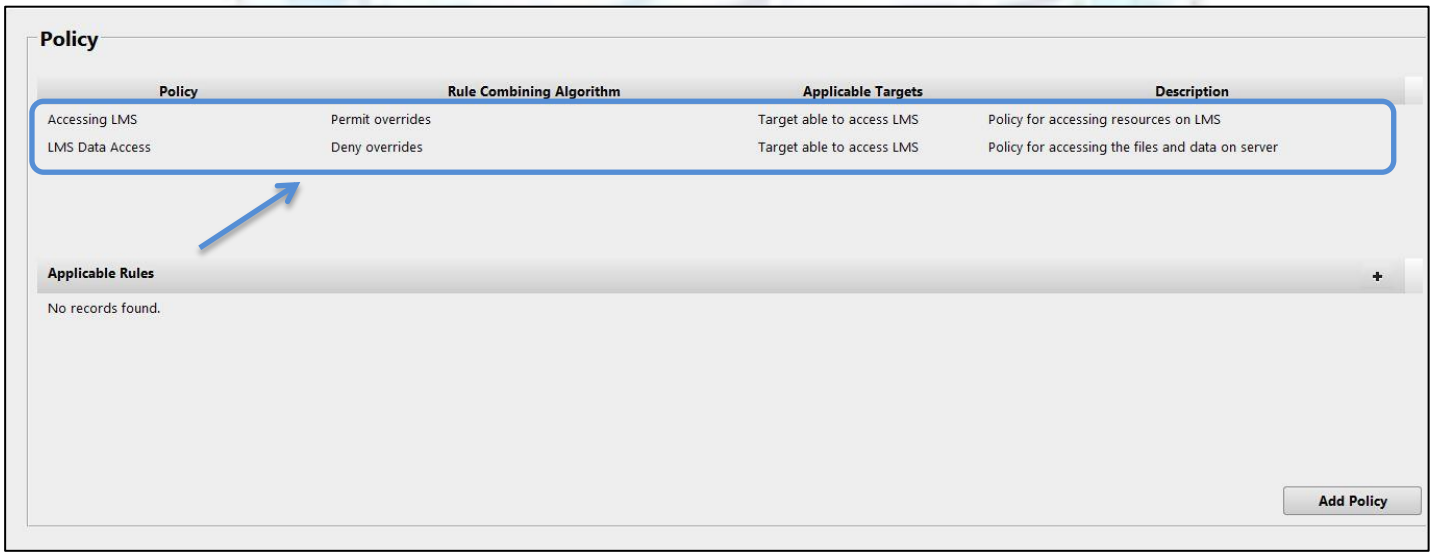


MP - 3: Delete Policy

1. In order to **Delete** any of the existing **Policy**, right click on that particular Policy and select **Delete** from the menu

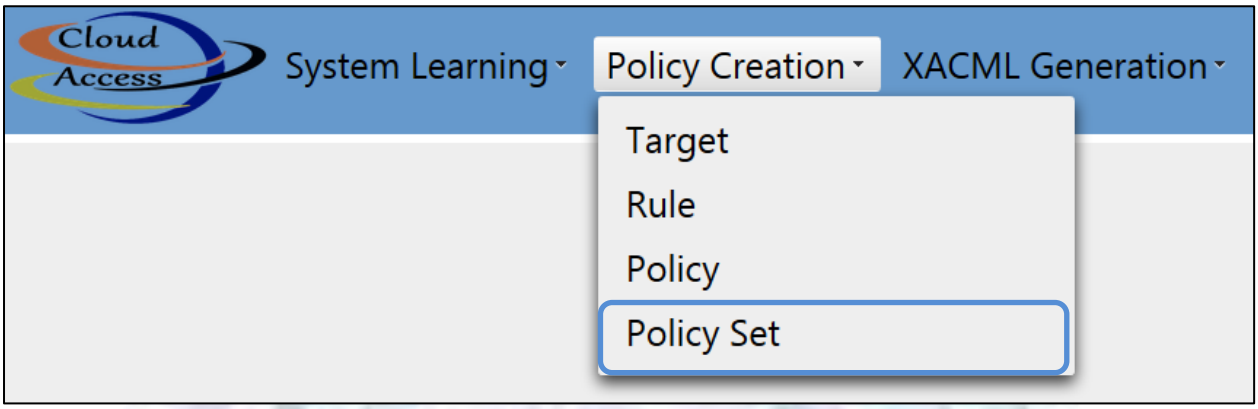


2. After the successful deletion of selected **Policy**, updated list of available Policy parameters is displayed on the **Policy** interface



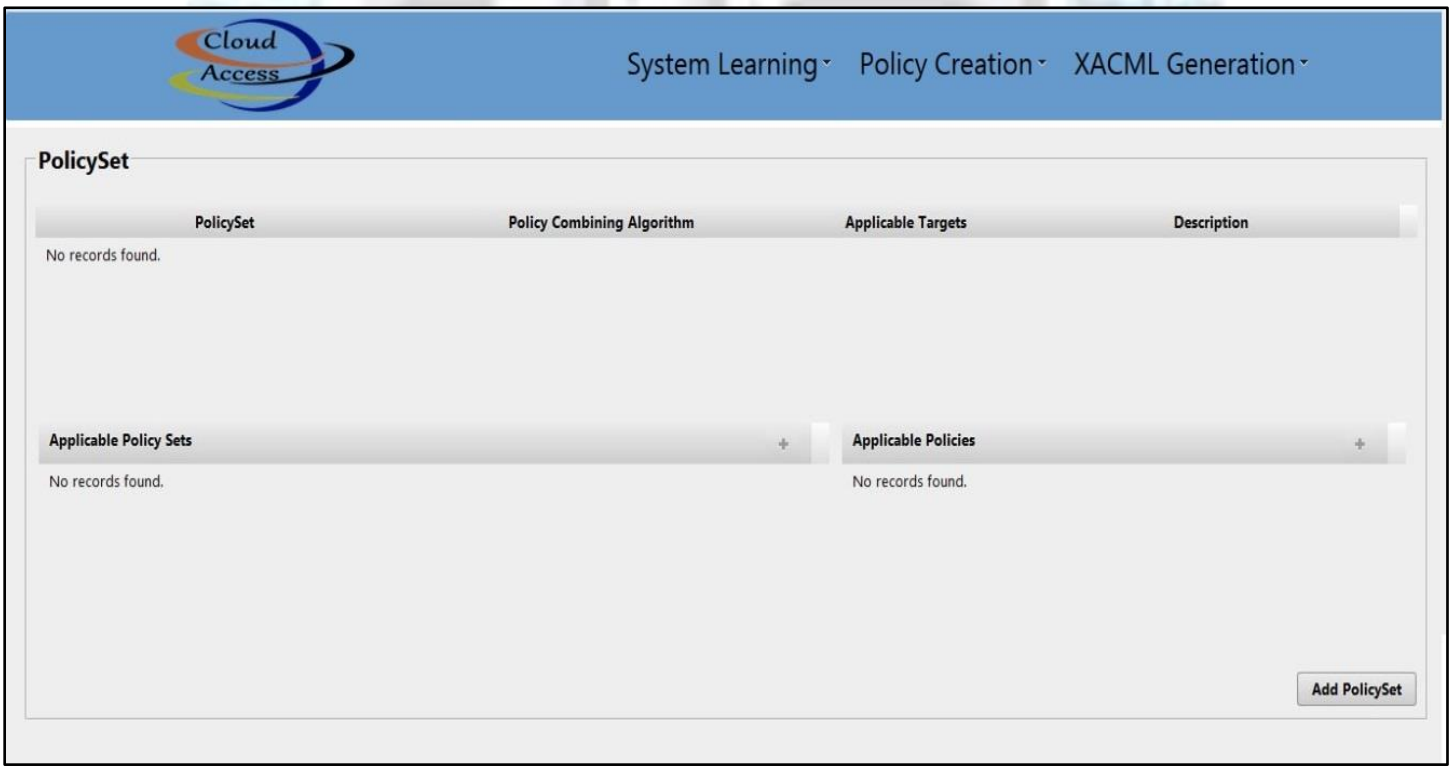
PC - 4. Manage Policy Set:

In order to add, update and delete **Policy Set** and its related parameters including Target, Rule and Policy, select **Policy Set** from the main **Policy Creation** dropdown-menu.

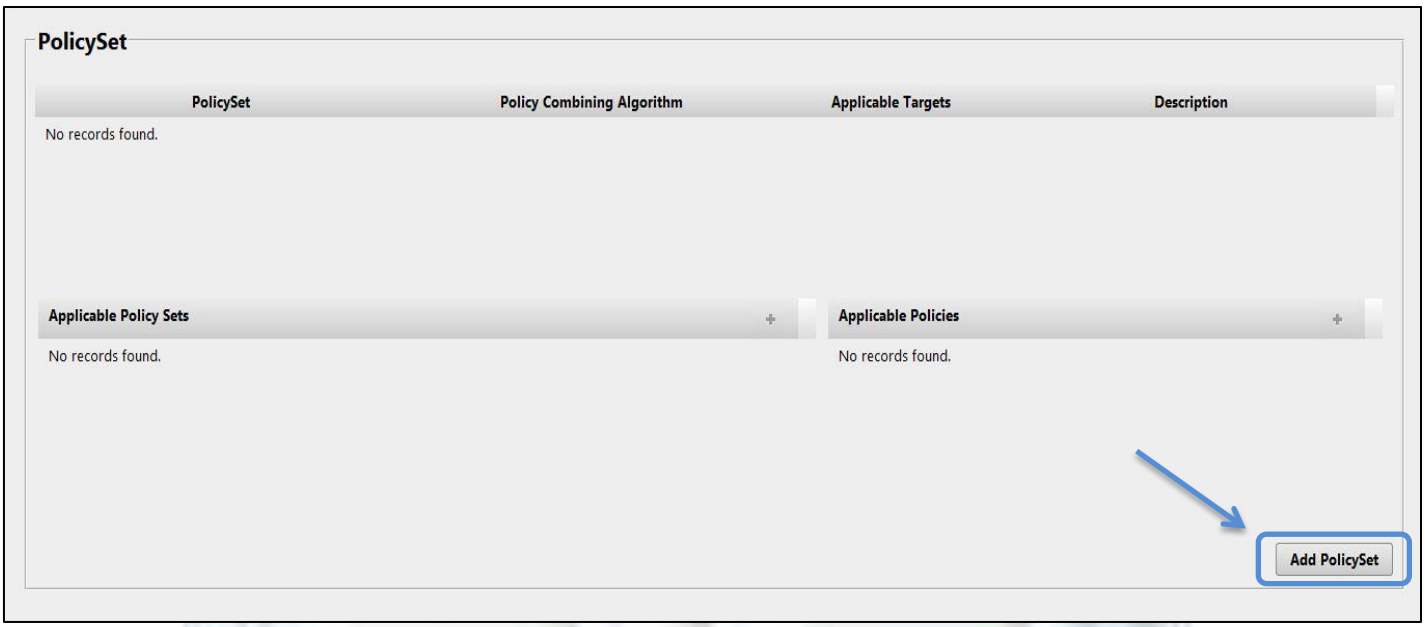


MPS - 1: Create Policy Set

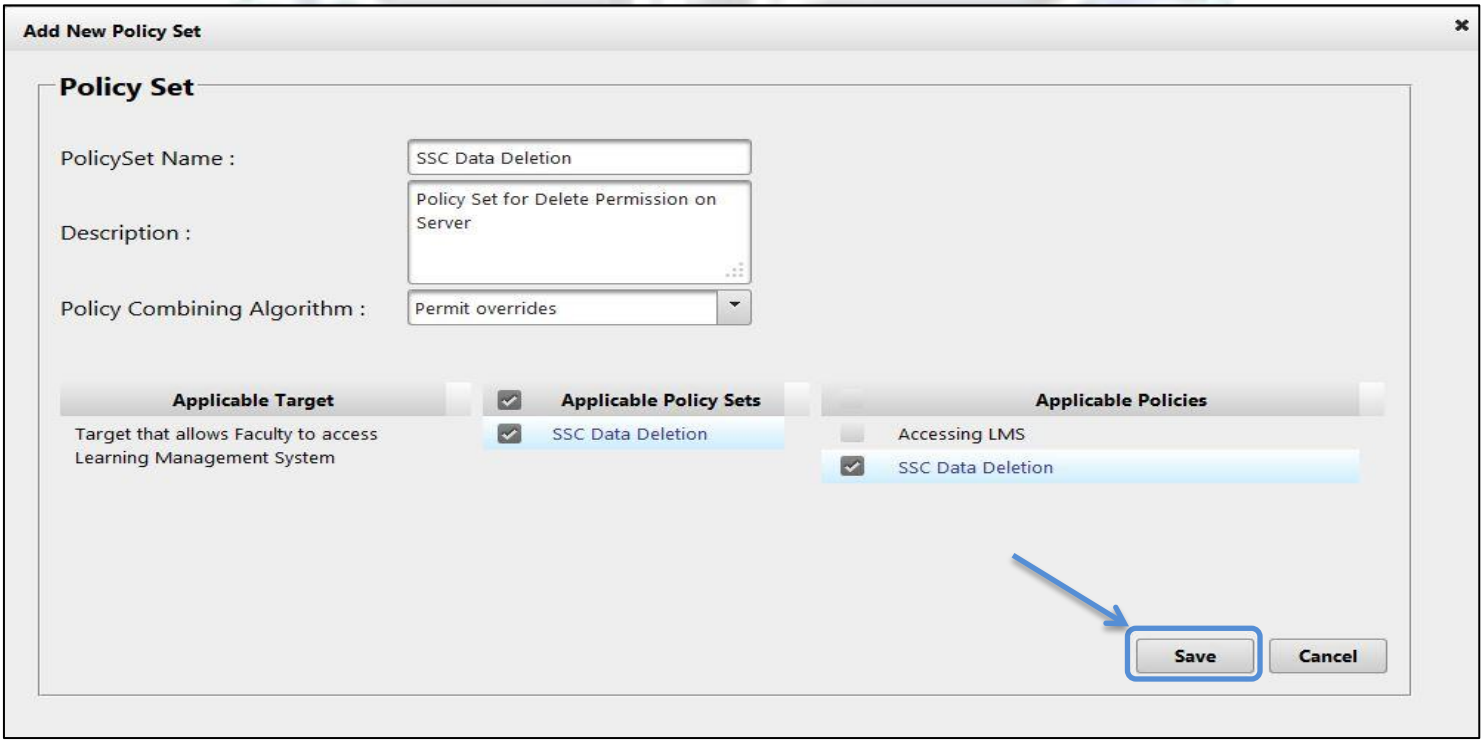
1. Below is the main **Policy Set** interface, which is used to add, update and delete Policy Set and its related parameters.



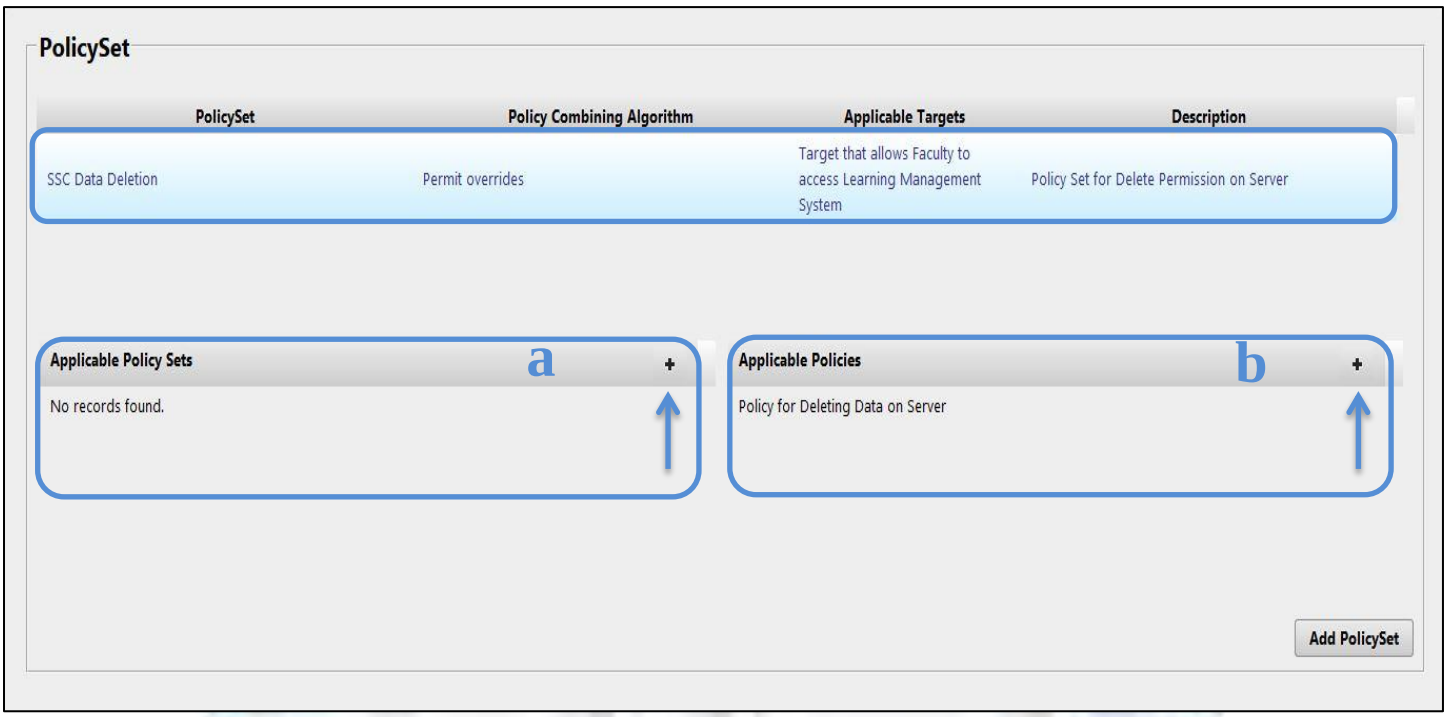
2. Click on **Add Policy Set** button, to add new Policy Set parameter into the database.



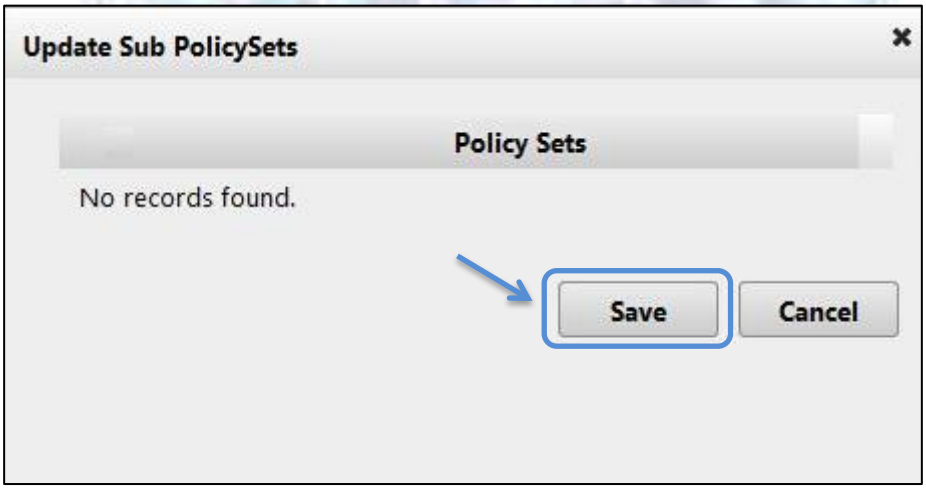
3. In the **Add New Policy Set** interface, specify PolicySet Name, Description, Policy Combining Algorithm along with the applicable Target. It provides the provision to add applicable Policies and Policy Sets into the newly created Policy Set. Click **Save** to insert the new Policy Set parameter into the database and **Cancel** to discard the added information.



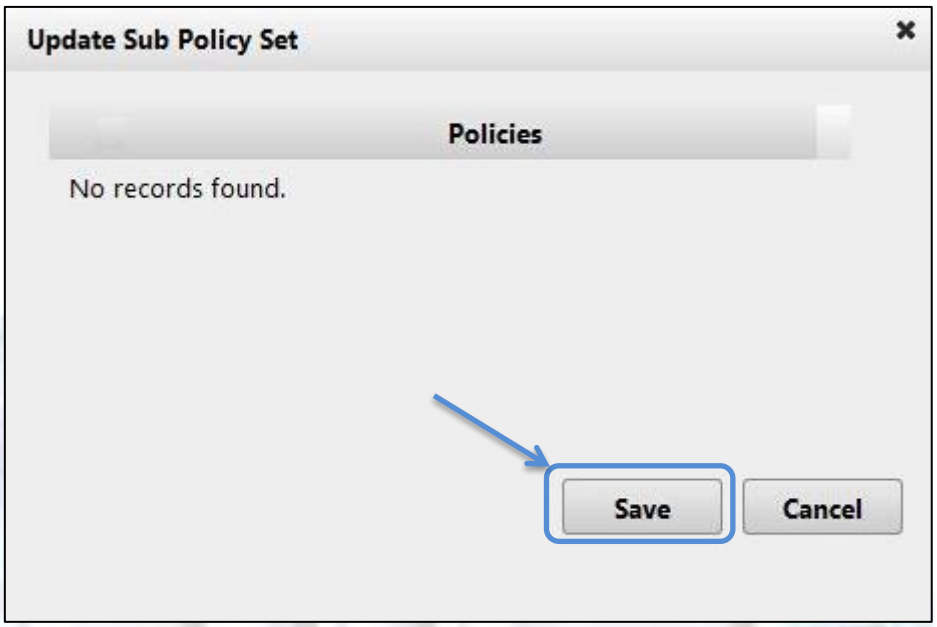
4. After the successful creation of **PolicySet**, newly added Policy Set with all of its related attributes will be displayed in the main PolicySet interface. Selecting any Policy Set from the available list enables the add/update "+" option for **Applicable Policy Sets** and **Applicable Policies**.



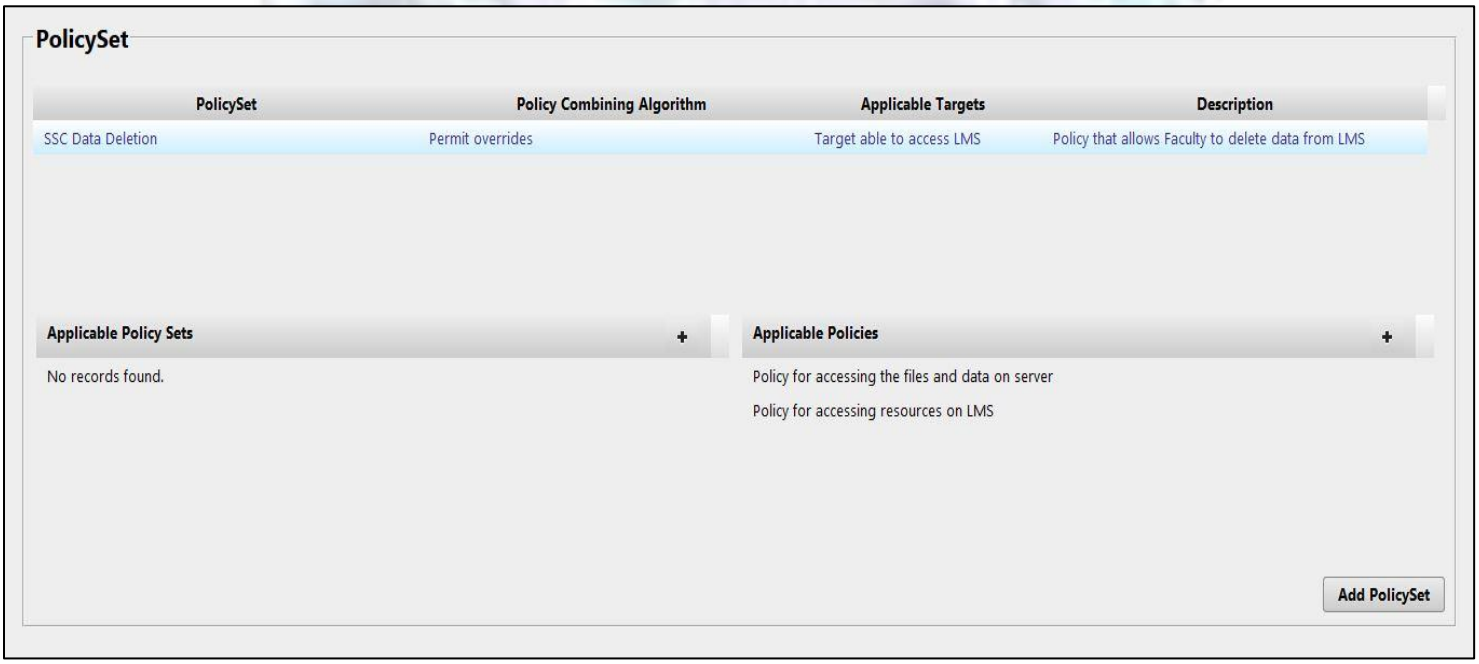
a) Click on "+" option to update the Applicable Policy Set attribute against any selected **Policy Set**



b) Click on "+" option to update the Applicable Policy attribute against any selected **Policy Set**

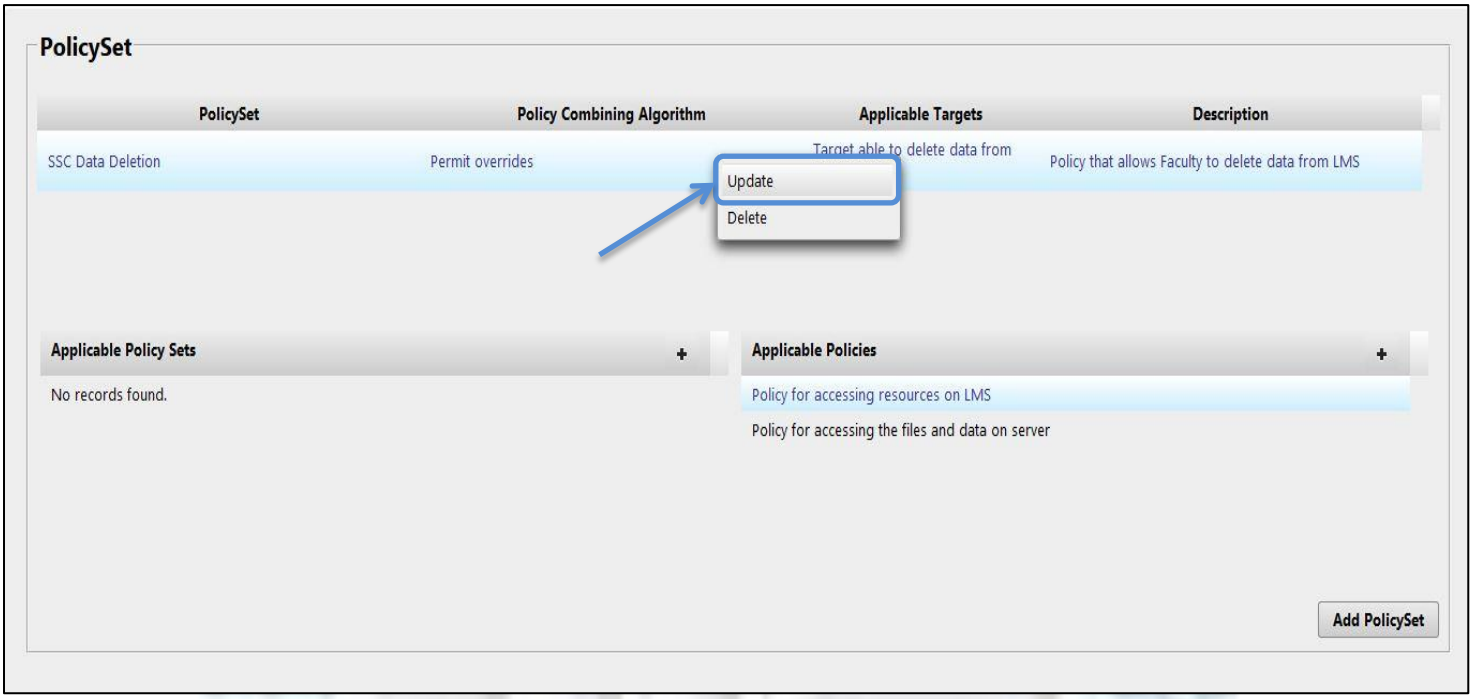


5. If saved successfully, newly added **Policy Set** with **Applicable Policies** will be displayed in the main **Policy Set** interface against the selected Policy Set.

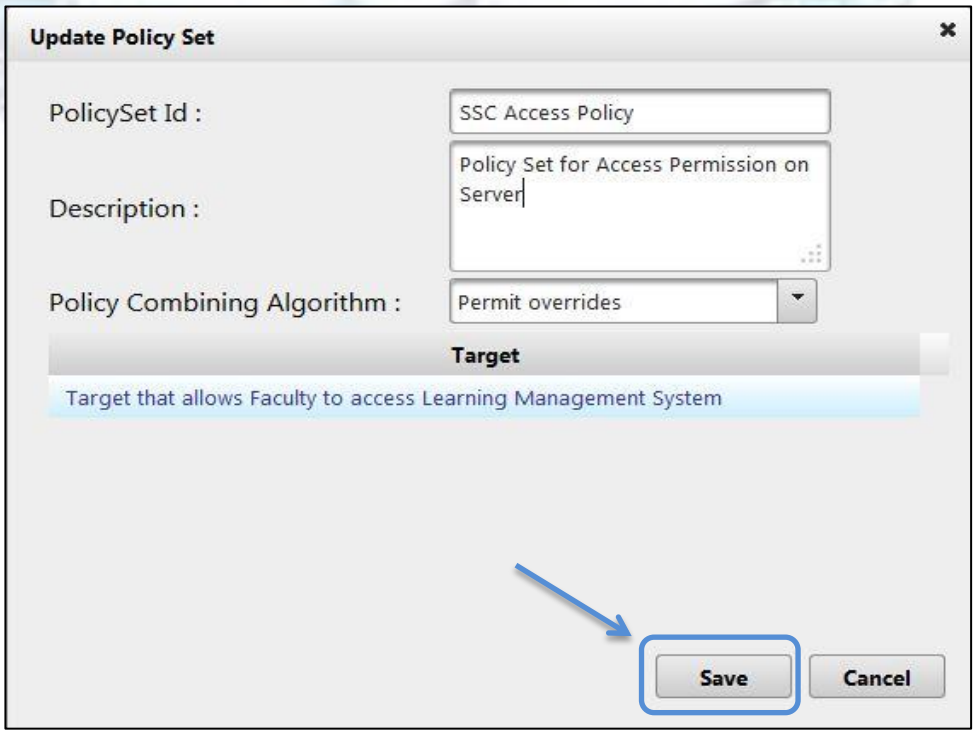


MPS - 2: Update Policy Set

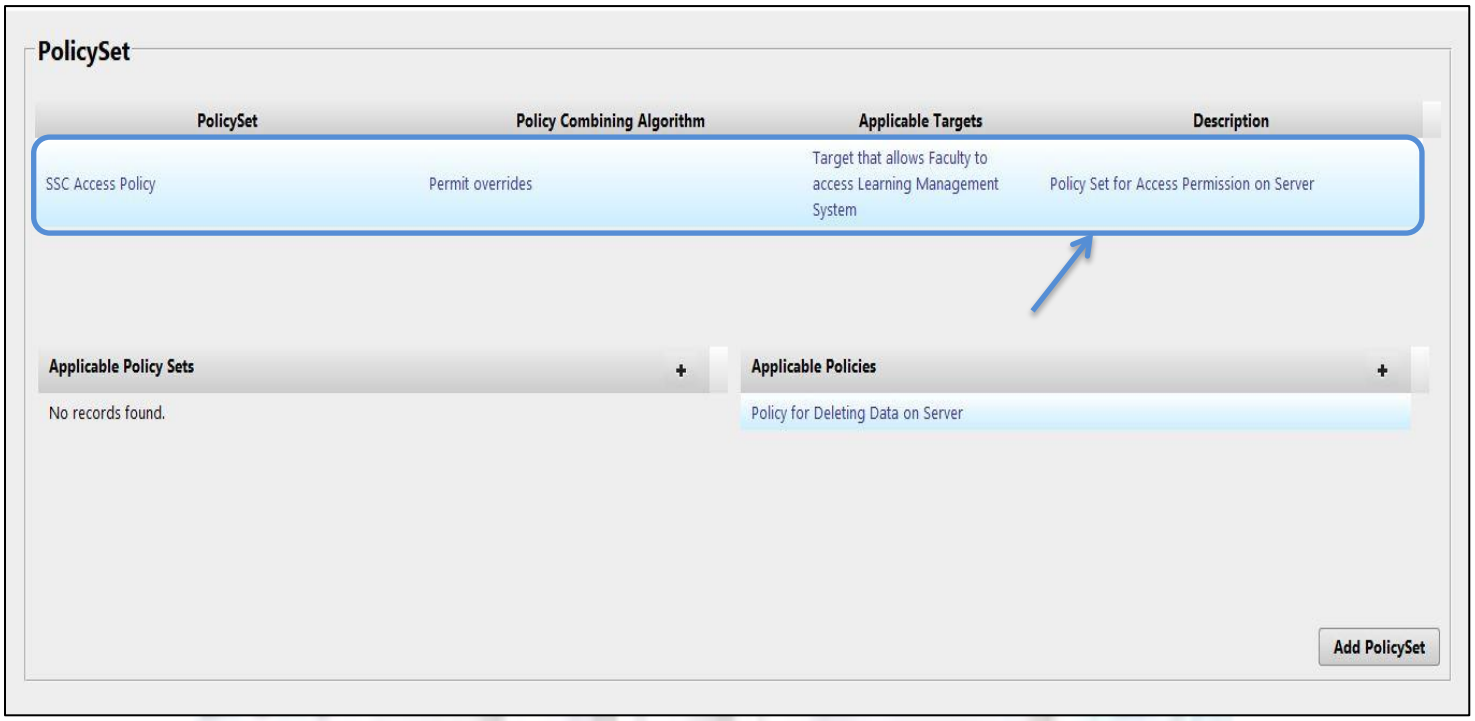
1. In order to update any of the existing **Policy Set**, right click on that specific Policy Set and choose **Update** from the displayed menu



2. In the **Update Policy Set** interface, edit any of the previously added Policy attribute and click **Update** to save the changes into the database

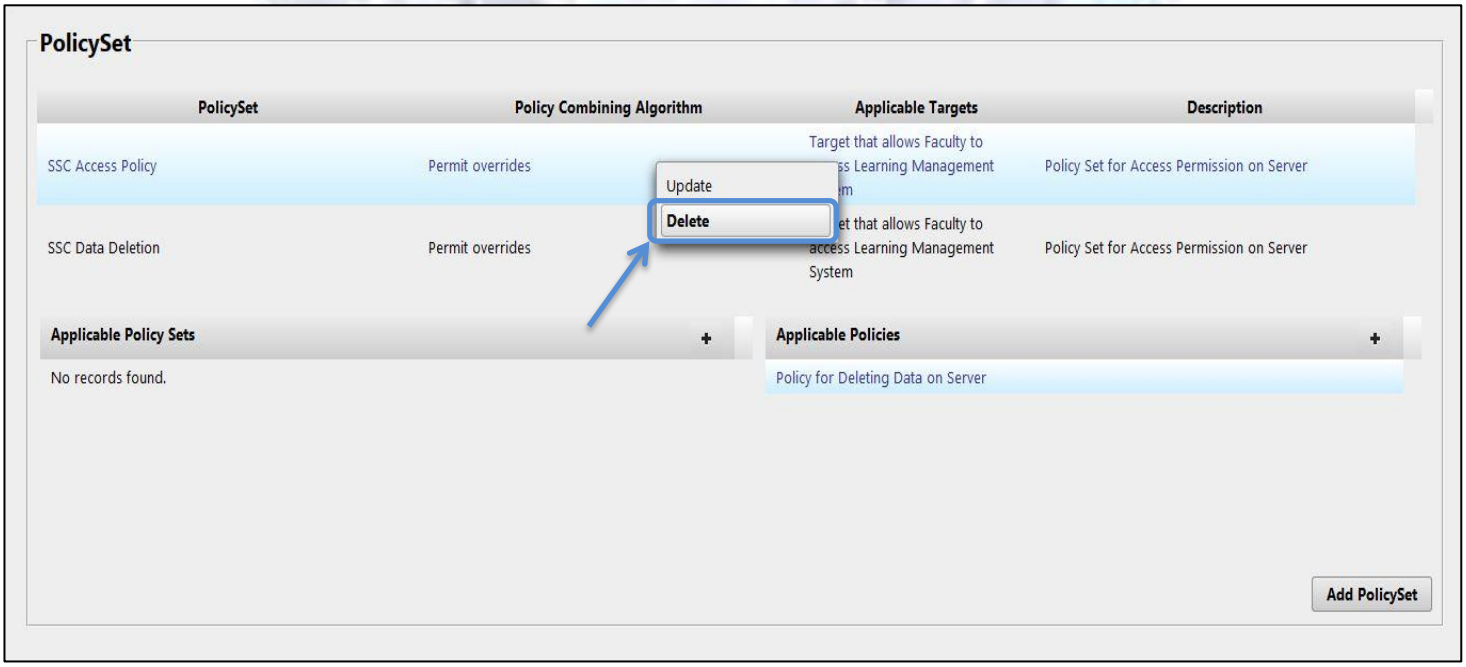


3. After the successful execution of update function, **Policy Set** interface displays the list of updated Policy Set parameters

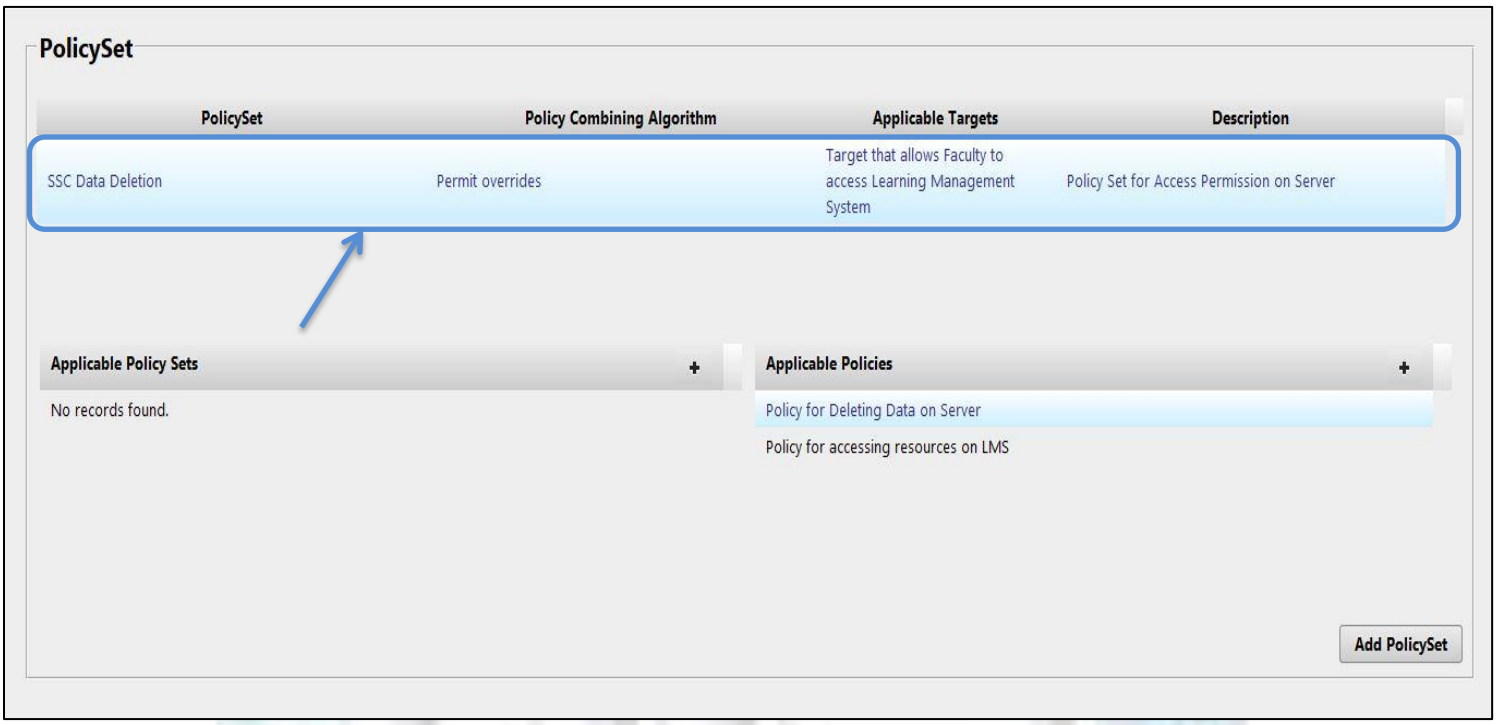


MPS - 3: Delete Policy Set

1. To **Delete** any of the existing Policy Set, right click on the **PolicySet** to be deleted and select **Delete** from the menu. As a result, selected Policy Set is deleted from the database server.

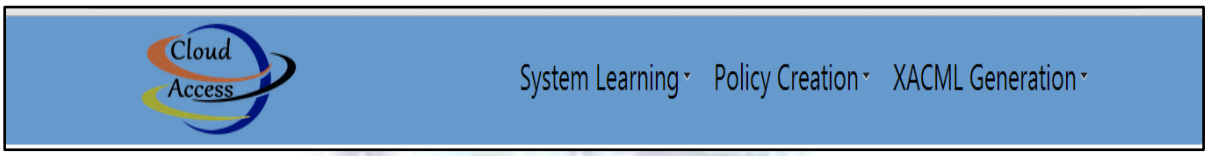


2. After the successful deletion of selected Policy Set, updated list of available Policy Sets is displayed in the main **Policy Set** interface.



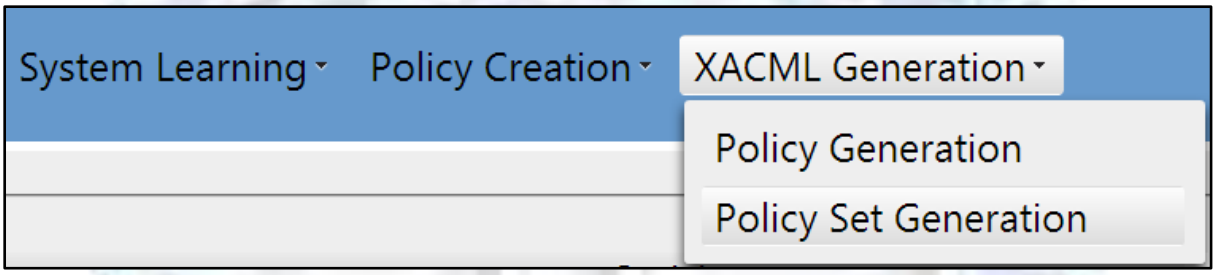
C. Policy Generation

This is the final section of this manual. In the following section, we have demonstrated the generation of XACML based **Policy** and **Policy Set.**

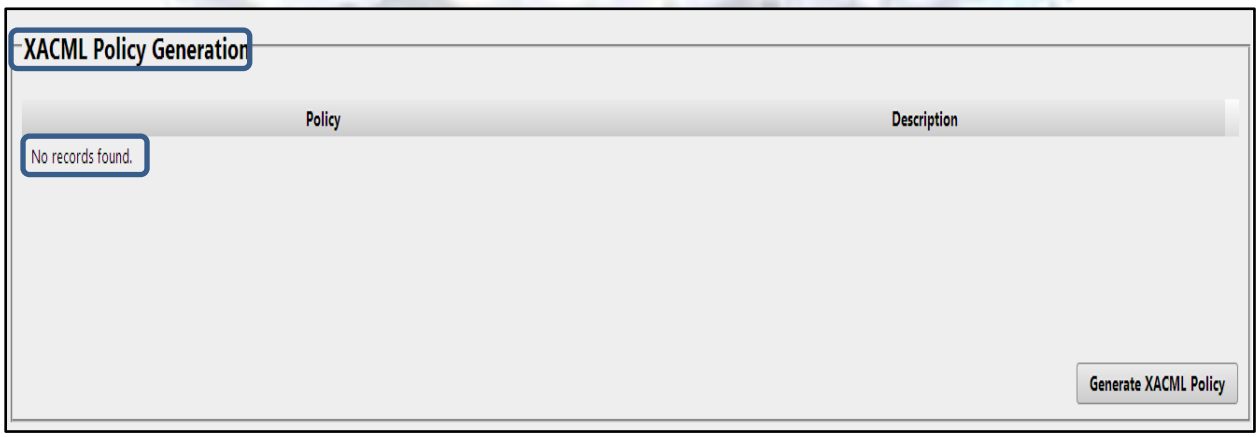


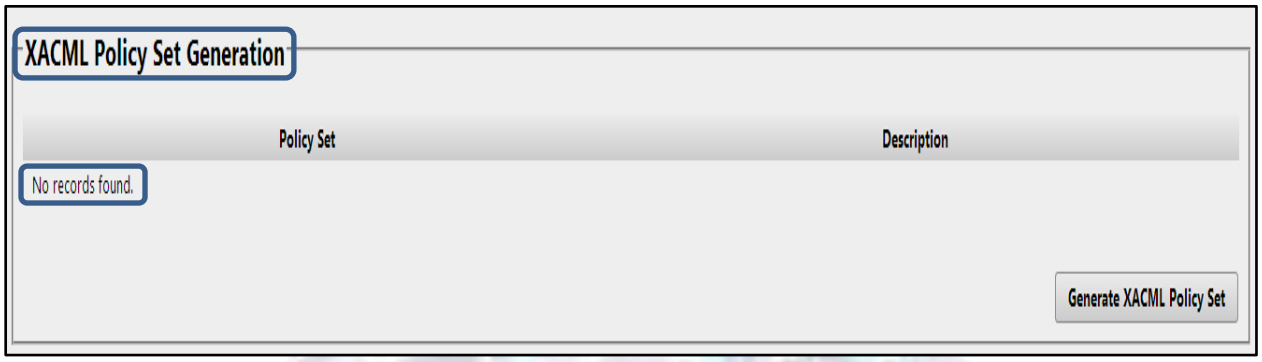
PG-1: Policy Generation

1. If we hover up cursor to the 'XACML Generation' a dropdown menu will appear showing two options **XACML Policy Generation** and **XACML Policy Set Generation**.

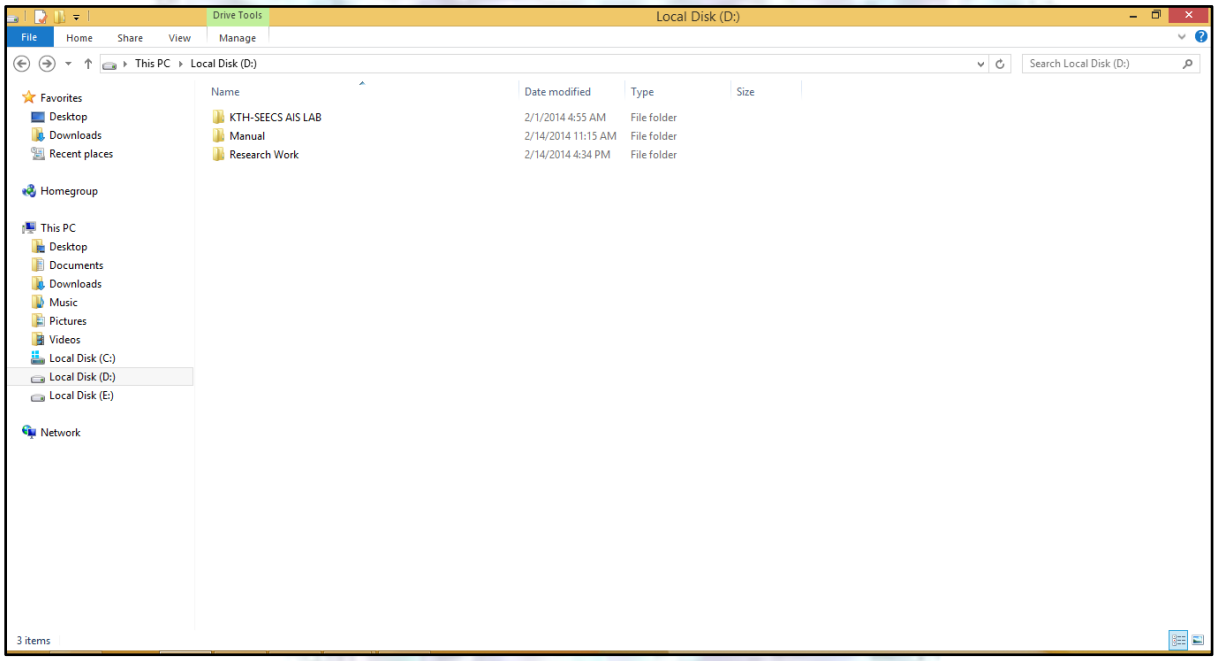


2. Initially, if there are no **Policies** or **Policy Sets** in the database the message "*No records found*" is displayed.

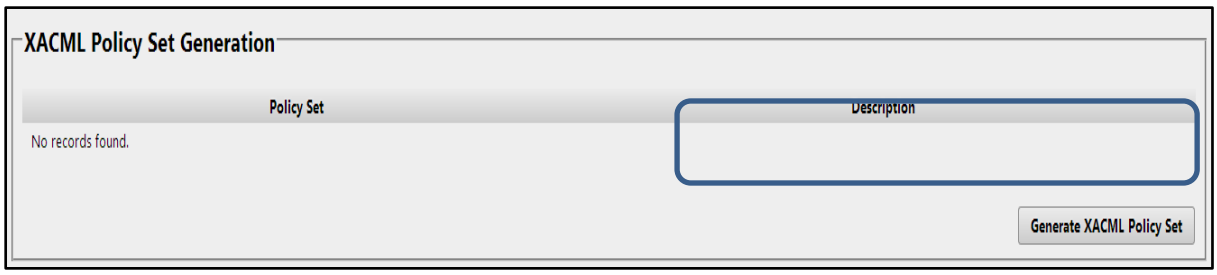




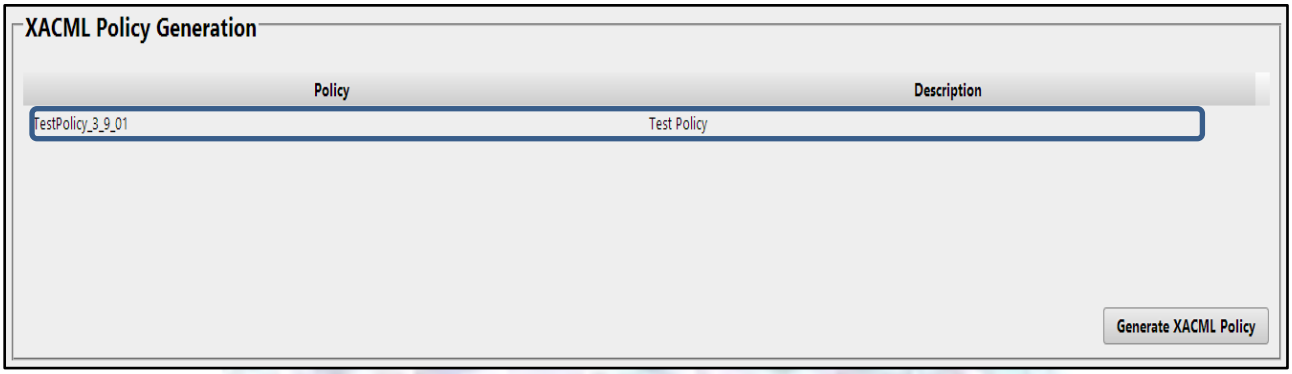
3. All the **policies** and **PolicySet** we will be generated in the D drive. Right now we have not generated **policies** or **PolicySet** therefore; the drive D is not showing any of it.



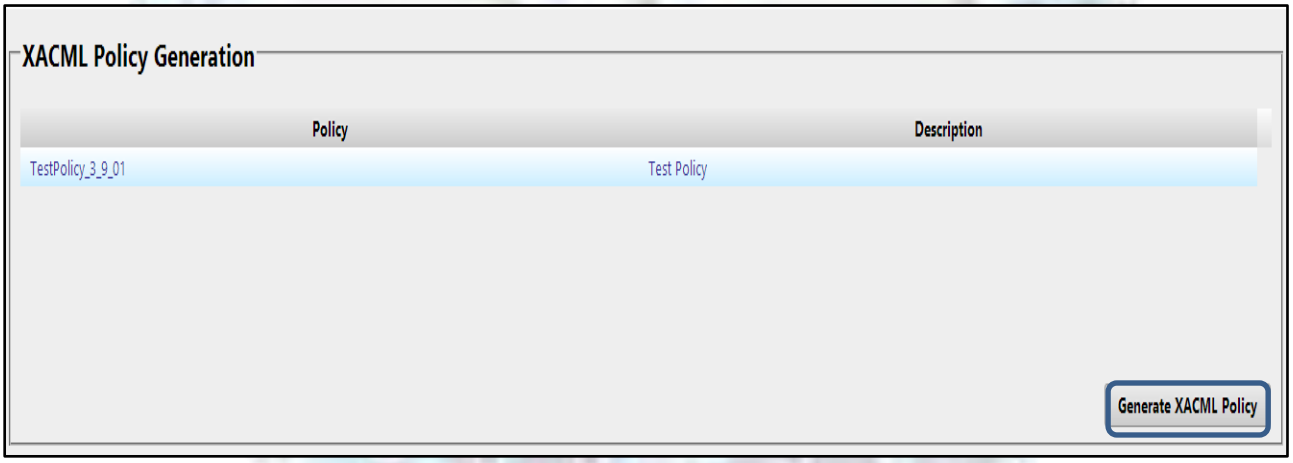
4. In the **XACML Generation** tab, click on the **Policy Generation** button.



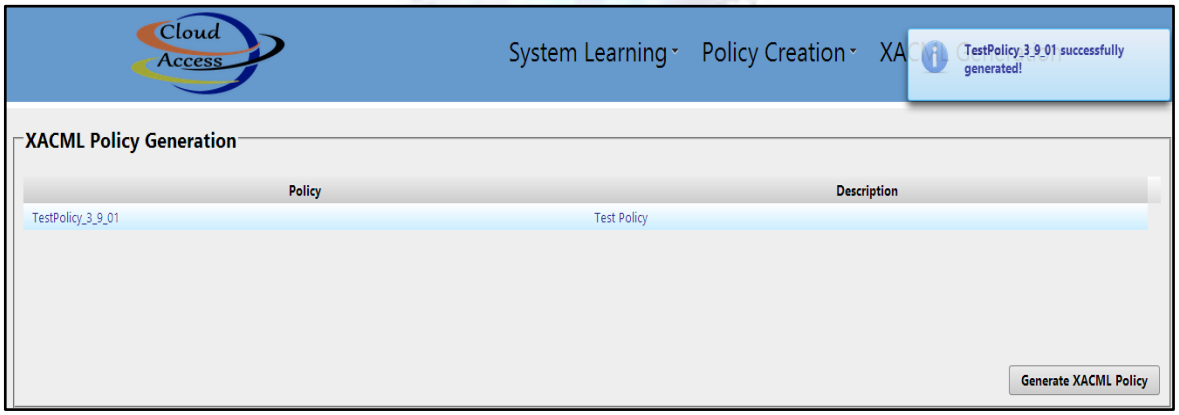
5. In our scenario, a "**TestPolicy_3_9_01**" is present in our database.



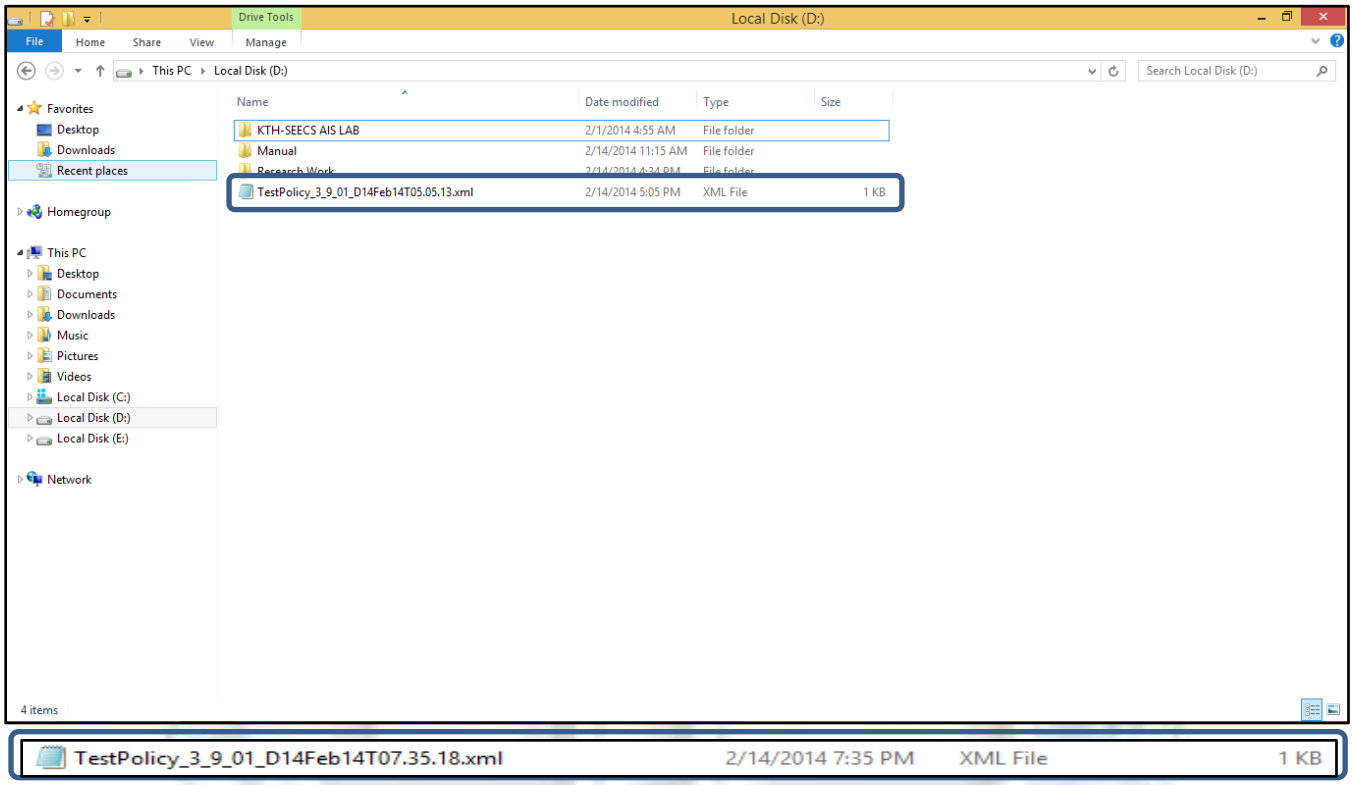
6. Select a specific Policy and click on **Generate XACML Policy** button to generate XACML based Policy.



7. A dialog box will pop up showing the Policy has been generated.

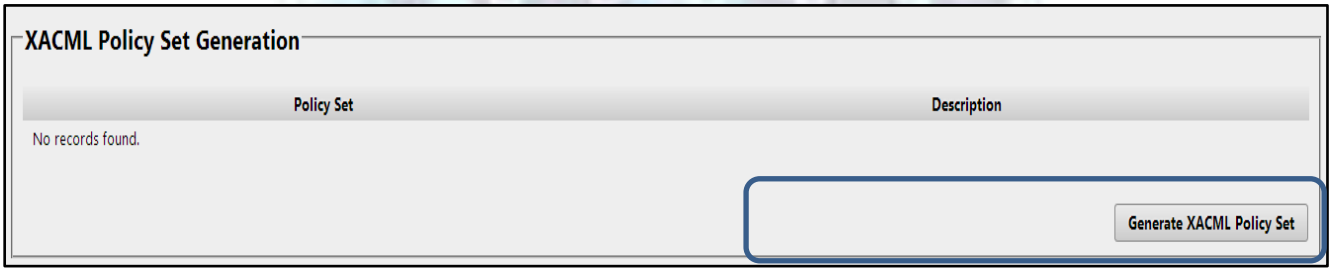


8. In the following figure we can see that our D drive has a "**TestPolicy**" file.



PG-2: Policy Set Generation

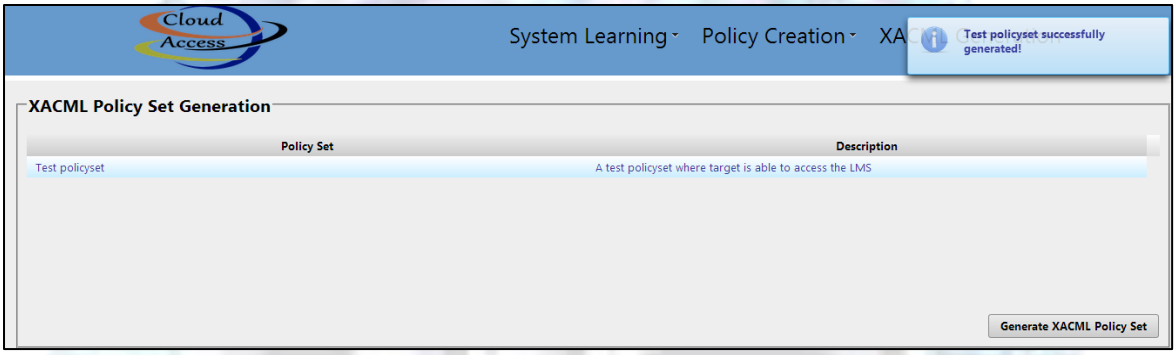
1. For generation of the **Policy Set**, click on the **Policy Set Generation** button under the **XACML Generation** tab.



2. To generate the XACML based policy set, first click on a specific policy set and it will be highlighted. Next click on "**Generate XACML Policy Set**" button.

XACML Policy Set Generation
Policy Set
Description
Test policyset
A test policyset where target is able to access the LMS
Generate XACML Policy Set

3. A dialog box will pop up showing the policy set has been generated.



4. In the following figure we can see that a "**PolicySet**" file is also created in our D drive.